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## Emergent Writing Skills In Preschool Children With Language Impairment

Stacey Lynne Pavelko  
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EMERGENT WRITING SKILLS IN PRESCHOOL CHILDREN WITH  
LANGUAGE IMPAIRMENT

by

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B.A. Youngstown State University, 1999  
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A dissertation submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in the College of Education  
at the University of Central Florida  
Orlando, Florida

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2011

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## ABSTRACT

Much research demonstrates that alphabet knowledge, phonological awareness, and emergent writing are all significant predictors of later reading and writing outcomes, and that children with language impairments (LI) are particularly at risk for later literacy difficulties. Further, children with LI consistently demonstrate depressed emergent literacy skills in the areas of phonological awareness, print concepts, and alphabet knowledge; however, little is known about their emergent writing skills. Therefore, the purposes of this study were twofold: (1) to compare the emergent writing skills of preschool children with language impairment to their typically developing peers using a range of writing tasks and a detailed, consistent scoring rubric for each task; and, (2) to explore the relationships among emergent writing skills and alphabet knowledge, phonological awareness, and oral language.

The participants included four groups of preschool children: 11 4-year-old children with LI; 11 4-year-old language typical (LT) children, age-matched to children with LI; 20 4-year-old children with typical language; and, 21 5-year-old children with typical language. Children with language impairment scored between 70 and 84 on the Language Index of *Assessment of Literacy and Language* (ALL) (Lombardino, Lieberman, & Brown, 2005), and children with typical language scored between 85 and 115. All children passed a bilateral hearing screen, scored within the normal range on a non-verbal intelligence screen, demonstrated an unremarkable developmental history relative to sensory, neurological, and motor performance, spoke English as their primary language, and had mothers with at least a high school education or equivalent.

During two sessions, children were administered the ALL and five emergent writing tasks: Write Letters, Write Name, Write CVC Words, Picture Description, and Sentence Retell. The writing tasks and accompanying scoring rubrics were adopted from a previous study by Puranik and Lonigan (2009).

Results indicated that children with LI demonstrated significantly less advanced letter and word writing skills than their language typical, age-matched peers. In addition, significant relationships between all emergent writing tasks and alphabet knowledge were observed for all children as well as significant relationships between oral language and phonological awareness for children with typical language. No significant relationships between any of the emergent writing tasks and phonological awareness or between oral language and alphabet knowledge were found. Further, results indicated the same developmental patterns exist in written as well as oral language for children with LI.

This study has therapeutic implications for speech-language pathologists. In particular, emergent writing tasks need to be included in comprehensive assessment and intervention approaches for children with LI. Assessments need to yield accurate descriptions of emergent writing skills relevant to later literacy outcomes. Finally, integrated intervention approaches that combine initial sound awareness tasks with alphabet knowledge and emergent writing tasks may achieve the best learning outcomes.

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## CHAPTER ONE: INTRODUCTION

### Significance of the Problem

Educators, researchers, and policy makers have long been concerned regarding the literacy skills of American students. As early as the 1870's, professors from Harvard and other elite colleges asserted that incoming students were unable to write coherent essays (Connors, 1997). In a 1975 cover story titled, "Why Johnny Can't Write," Newsweek General Editor Merrill Sheils condemned educators for not teaching students how to write. Unfortunately, many of these same concerns are still valid today. The Alliance for Excellent Education estimates that nearly 7,000 students drop out of high school every day, with one of the most cited reasons being that students do not have the literacy skills necessary to keep up with the increasingly complex high school curriculum (Kamil, 2003; Pinkus, 2006; Snow & Biancarosa, 2003). This estimate is supported by data collected by the National Assessment of Educational Progress (NAEP), which found that 26% of twelfth grade, 25% of eighth grade, and 33% of fourth grade students scored below *basic* on the 2009 reading assessment (NCES, 2009; NCES, 2010); and, 8% of eighth grade and 15% of twelfth grade students scored below *basic* on the 2007 writing assessment (Salahu-Din, Persky, & Miller, 2008). These data demonstrate that many students struggle to achieve *basic* levels of both reading and writing proficiency.

In this context of poor literacy achievement, the literacy demands of the 21<sup>st</sup> century workplace have increased dramatically. According to the New Commission on the Skills of the American Workforce, “strong skills in English, mathematics, technology, and science, as well as literature, history, and the arts will be essential for many...candidates” (2007, p. 8). For example, Barton (2000) found that the literacy demands of the 25 fastest growing professions are far greater than average literacy demands, while the 25 fastest declining professions have lower than average literacy demands. Additionally, the American College Testing (ACT) service reported that the knowledge and skills required for higher education and for employment are now equivalent (ACT, 2006; American Diploma Project, 2004).

While literacy demands are increasing, several major reports assert that adolescents do not have the literacy skills required by employers. Data from a variety of sources indicate that adolescents must possess advanced writing skills to be successful in the workplace. For example, the National Commission on Writing (2004) reported that most job growth over the next decade will occur in the service industries and 80% or more of salaried employees have some responsibility for writing; 51% of companies consider applicants writing skills when hiring salaried employees; and, more than half of companies take writing skills into account when making promotion decisions for salaried employees. These findings are corroborated by the Partnership for 21<sup>st</sup> Century Learning, which reported that 52.7% of employers ranked written communications as “very important” for job success. Recent NAEP data, however, demonstrate that very few adolescents possess advanced writing skills. Only 2% of eighth grade and 1% of twelfth grade students scored at the *advanced* level on the 2007 writing assessment (Salahu-Din, et al., 2008). While these reports demonstrate that today’s students must possess more advanced literacy skills than those required of previous generations in order to meet the demands of

competing in a global market (Snow, Burns, & Griffin, 1998), many students struggle to achieve basic levels of literacy and few students attain advanced literacy skills necessary for success in the 21<sup>st</sup> century workplace.

Students with language impairments are at even greater risk for literacy difficulties (Bishop & Adams, 1990). When compared to their peers, school-aged students with language impairments not only demonstrate weaknesses in oral language abilities, but they also demonstrate a particular weakness in writing skills (Bishop & Clarkson, 2003; Gillam & Johnston, 1992; Windsor, Scott, & Street, 2000). Several research studies have reported that students with language impairments exhibit significantly more grammatical errors in their writing when compared to their reading-, language-, and age-matched peer groups (Gillam & Johnston, 1992; Windsor, et al., 2000).

The number of children with language impairments is not insignificant. Longitudinal investigations estimate the prevalence of specific language impairment (SLI) to be 7.4% and further estimate that 50 to 80% of children with language impairments will present literacy difficulties during the early school years that persist into adolescence (Bishop & Adams, 1990; Bishop & Edmundson, 1987; Botting, Simkin, & Conti-Ramsden, 2006; Catts, 1991; Stark & Tallal, 1988; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998; Tomblin et al., 1997; Wilson & Resucci, 1988). Data from the students with disabilities subgroup of the NAEP assessments provides some empirical support for these estimates. These data, however, must be interpreted with caution, because the students with disabilities category is not limited only to students with specific language impairments but also includes students with mild to moderate learning and/or emotional disabilities. Nevertheless, since a majority of these other students also exhibit language impairments, the data provide a rough estimate of how students with language



impairments perform on these assessments. On the 2007 writing assessment, 45% of eighth grade and 56% of twelfth grade students with disabilities scored below the *basic* level, compared to 8% and 15%, respectively, of their typically developing peers. Perhaps more concerning are the findings that no students with disabilities in either eighth or twelfth grade scored at the advanced level on the 2007 writing assessment (Salahu-Din, et al., 2008). Together, the research indicates that children with language impairments demonstrate literacy difficulties that surpass those of their typically developing peers. These difficulties often present during preschool and kindergarten in the spoken language domain but for many children shift to the written domain and persist into the school-age, adolescent, and adult years. Further, the impact of these difficulties not only affects academic success but also vocational success and social and emotional well-being (Barton, 2005; Snowling, Bishop, Stothard, Chipchase, & Kaplan, 2006; Tomblin, Zhang, Buckwalter, & Catts, 2000). Strong evidence shows that these students are at greater risk for dropping out of high school and for encountering difficulties with the juvenile justice system (Catterall, 1985; US Department of Education, 2003; Western, Schiraldi, & Zienberg, 2004). In addition, many of them find less rewarding jobs in the workplace and do not fulfill their vocational potential (Adair 2001; Thoresten, 2002). Finally, these students are more likely to receive negative attention due to their language impairments and may demonstrate low self-esteem (Durkin & Conti-Ramsden, 2007; Knox & Conti-Ramsden, 2007).

On a more positive note, it is now possible to identify children at-risk for or diagnosed with language and literacy difficulties during the preschool years. Studies comparing the emergent literacy skills of children with LI or at risk for later literacy problems to those of their typically developing peers, have consistently demonstrated depressed emergent literacy skills in phonological awareness, print concepts, and alphabet knowledge for children with LI (Boudreau

& Hedberg, 1999; Gillam & Johnston, 1985; Kamhi, Lee, & Nelson, 1985; Magnusson & Naucler, 1990; Nathan, Stackhouse, Goulandris, & Snowling, 2004) or at risk for later literacy problems (Justice, Bowles, & Skibbe, 2006; Lonigan, Anthony, Bloomfield, Dyer, & Samwel, 1999; Zevenbergen, Whitehurst, & Zevenbergen, 2003). Further, early intervention has been shown to prevent the development of severe literacy problems in children at risk for language and literacy difficulties and to reduce or ameliorate those same problems in children with language impairment. Research from several large-scale studies, including the report of the National Reading Panel, the report of the National Early Literacy Panel, and the Head Start Impact Study, all document that early interventions aimed at increasing alphabet knowledge and phonological awareness skills in typically developing children, as well as children at risk for literacy difficulties and children with identified disabilities, are effective (National Institute of Child Health and Human Development, 2000; NELP, 2008 U.S. Department of Health and Human Services, 2010).

Very little is known, however, about the emergent writing skills of children with LI. To date, only one research study has examined how preschool children with LI acquire name-writing abilities. This study was limited to a single writing task and did not address the range of tasks possible for young, preschool children such as writing letters or sentences. Since emergent writing has been identified as a key predictor of later literacy outcomes, it is important to explore its development in preschool children with LI as well as its relationship to other emergent literacy components.

## Research Purposes

The purposes of this research are two-fold. First, this study will compare the emergent writing skills of preschool children with language impairment to their typically developing peers using a range of writing tasks and a detailed, consistent scoring rubric for each task (Puranik & Lonigan, 2009). Use of a range of tasks will provide more comprehensive information about the development of emergent writing in young children; whereas, use of a detailed, consistent scoring rubric will allow for more cogent comparisons among current and future studies as well as generalization across studies (Puranik & Lonigan, 2009).

Second, this study will explore the relationships among emergent writing skills and other emergent literacy components, specifically, alphabet knowledge (AK) and phonological awareness (PA) as well as the relationship between emergent writing and oral language. To date, both AK and PA have been found to be the most robust predictors of later literacy skills (NELP, 2008). Although research has demonstrated that emergent writing, alphabet knowledge, and phonological awareness are all significant predictors of later reading and writing outcomes (NELP, 2008), the relationship of emergent writing to the other components of emergent literacy is not well understood. Only three studies have examined the relationship of emergent writing to the other components of emergent literacy (Bloodgood, 1999; Cabell, Justice, Zucker, & McGinty, 2009; Welsch, Sullivan, & Justice, 2003), and all have been limited to name writing only. Further, only one study has examined the relationship of emergent writing to other emergent literacy components in the context of language impairment (Cabell, et al., 2009).

## Research Questions

The specific research questions addressed in this study include:

1. Do 4-year-old preschool children with language impairment demonstrate significant differences in their emergent writing skills when compared to their age-matched, language typical peers?
2. Do 4-year-old preschool children with language impairment demonstrate the same developmental sequence in their emergent writing skills as their age-matched language typical peers?
3. Do language typical 4-year-old preschool children demonstrate significant differences in their emergent writing skills when compared to language typical 5-year-old preschool children?
4. What are the relationships among emergent writing, alphabet knowledge, phonological awareness and oral language for both children with typical language development as well as children with language impairment?

## Hypotheses

1. Children with language impairment will demonstrate less advanced emergent writing skills when compared to their age-matched language typical peers.

2. Children with language impairment will demonstrate the same developmental sequence in their emergent writing skills as their age-matched language typical peers.
3. Language typical 4-year-old preschool children will demonstrate less advanced emergent writing skills on all emergent writing tasks when compared to language typical 5-year-old preschool children.
4. There will be significant, positive relationships among emergent writing and alphabet knowledge, phonological awareness, and oral language.

### Limitations

This study is limited in the following ways:

1. It employs a cross-sectional design and will be unable to address questions about how a particular child or group of children changeover time with regard to emergent writing skills;
2. The participants were not randomly selected from the population. Therefore, the results of the study will not be generalizable beyond the sample investigated;
3. The researcher's objectivity may be affected by knowledge of participants' group status, thereby influencing participants' reactions to tasks and biasing the results in favor of one group or another;
4. To the extent that the participants are aware of their participation in a research study, the results may not be generalizable beyond the experimentally accessible population.

## Delimitations

The delimitations of this study were as follows:

1. The study included three groups of participants: 11 4-year-old children with LI; 20 language typical 4-year-old children, 11 of whom were age-matched to the children with LI; and, 20 language typical 5-year-old children.
2. Study participants had to meet several inclusion criteria:
  - a. Demonstrate an unremarkable developmental history in the areas of sensory, neurological, and motor performance as reported by the mother or other caregiver on a questionnaire;
  - b. Pass a bilateral hearing screening (25dB at 500, 1000, 2000, and 4000 Hz);
  - c. Achieve a standard score of 85 or higher on a nonverbal cognitive screening instrument (i.e., matrices subtest of the *Kaufman Brief Intelligence Test, 2<sup>nd</sup> Ed.*, (K-BIT-2; Kaufman & Kaufman, 2004);
  - d. Reside in a home where English is the primary language spoken;
  - e. Have a mother with a high school education, or equivalent, or higher;
  - f. Children with LI had to achieve a standard score between one and two standard deviations below the mean (i.e., scores between 70 and 84) on the Language Index of the *Assessment of Literacy and Language (ALL; Lombardino, Lieberman, & Brown, 2005)*;
  - g. Children with typical language had to achieve a standard score within one standard deviation of the mean (i.e., scores between 85 and 115) on the Language Index of the ALL;

3. Study participants completed two testing sessions on separate days, no more than 14 days apart;
4. The data obtained for the emergent writing tasks was confined to the Writing Sample Protocol as outlined in Puranik and Lonigan (2009).

### Assumptions

The following assumptions were made in this study:

1. The groups of language-impaired and language-typical children were matched on age; other variables that may affect language use such as motivation and personality characteristics were present among the language-impaired and language-typical groups.
2. The criteria used to identify children with language impairment were consistent with criteria reported elsewhere in the literature and accurately identified children with language impairments (Leonard, 1998; Tomblin, et al., 1997).
3. The researcher, a licensed and certified speech-language pathologist (SLP), and research assistants, trained and supervised by a licensed and certified SLP, were qualified to administer and score all assessments used in this study.

## CHAPTER TWO: REVIEW OF LITERATURE

This review of literature will explore three major topics related to the current study: the theoretical framework used to explain emergent literacy development; critical components of emergent literacy predictive of later reading achievement, including emergent writing, alphabet knowledge, and phonological awareness; and, the important relationships that exist among these key emergent literacy components. Sections on emergent literacy components will include a definition of the component and a description of the development of the component in children who are developing language typically and children with language impairments (LI).

### Emergent Literacy

In the literature, emergent literacy has been referred to as both a perspective (Pence, 2007; Teale & Sulzby, 1986) and a theory (Justice, 2006; Tracey & Morrow, 2006). Regardless of its classification, emergent literacy refers to the knowledge, skills, and attitudes about literacy that develop before the acquisition of conventional reading and writing skills as well as the environments that support its development (McNaughton, 1995; Reese, Cox, Harte, & McAnally, 2003; Teale & Sulzby, 1986). The term *emergent literacy* was originally coined by Marie Clay (1967), who argued against the generally regarded reading readiness model, the prevailing model at the time. The reading readiness model conceptualized literacy during early



childhood from an adult perspective, characterizing early literacy knowledge as a precursor to “real” reading and writing. According to the reading readiness model, learning to read and write began after children entered school and started formal instruction in reading (Teale & Sulzby, 1986).

In contrast, Clay (1967) viewed literacy from a developmental perspective, contending that children learned literacy skills prior to school entry. Clay maintained that children demonstrated knowledge about literacy prior to the start of formal education; therefore, she believed literacy instruction should not be withheld from children until they demonstrated reading readiness by mastering precursor skills. She went on to point out that children will only learn literacy skills by having contact with written language and suggested that children who demonstrate early difficulties with literacy skills should receive additional instruction. Waiting until children master precursor skills, she noted, could result in failure to develop literacy skills or delayed development of those same skills.

Teale and Sulzby (1986) extended Clay’s conceptualization of emergent literacy by noting the following (numbering from original text):

2. Listening, speaking, reading, and writing abilities (as aspects of language – both oral and written) develop concurrently and interrelatedly, rather than sequentially....
3. ... the functions of literacy are as integral a part of learning about writing and reading during early childhood as are the forms of literacy.
4. Children are doing critical cognitive work in literacy development during the years from birth to six.
5. Children learn written language through active engagement with their world....
6. Although children’s learning about literacy can be described in terms of generalized stages, children can pass through these stages in a variety of ways and at different ages.... (p. xviii)

Because of the interrelated nature of development in speaking, listening, reading, and writing, Tracey and Morrow (2006) suggested that children who excel early in speaking and listening also tend to excel at early reading and writing tasks; whereas, children who are delayed in the areas of speaking and listening tend to be more at risk for reading difficulty (Snow, et al., 1998).

The critical period in which emergent literacy takes place also necessarily emphasizes the important role that children's home environments play in their development of literacy skills. Children who come from homes in which a large number of books are available and whose caregivers frequently engage them in literacy activities tend to have more accelerated and stronger literacy skills than children who do not experience such literacy-rich environments. Although many factors, such as parent's education and occupation, are important to children's literacy success, the quality of the home literacy environment correlates most closely with children's early literacy abilities (Tracey & Morrow, 2006).

Many literacy experts and authors characterize literacy development along a continuum of stages that includes emergent, early, and conventional literacy (Chall, 1983; Ehri, 1991; Justice, 2006). The term *emergent literacy stage* specifies the period of time when children are acquiring knowledge about literacy but are not yet conventional readers. Although most experts and authors agree that the emergent literacy stage ends around five years of age, when children in the United States enter kindergarten and are exposed to formal instruction in reading and writing (Justice, 2006; Rhyner, Haebig, & West, 2009), Tracey and Morrow (2006) caution that this time frame should be used as a guideline and should not be conceptualized as a strict stage model. They note that precocious children may leave the emergent literacy stage and enter the early literacy stage before the start of kindergarten; whereas, children with developmental delays may remain in the emergent literacy stage for a longer period of time.

In conclusion, the emergent literacy theory or perspective represents a significant departure from earlier theories of literacy development. More specifically, it differs from other theories on two key issues. First, the emergent literacy theory conceptualizes literacy as a continuum from pre-reading to reading without a clear boundary between the two; whereas, other theories tend to view literacy as an all-or-none phenomenon that starts when children begin school. Second, the emergent literacy theory views speaking, listening, reading, and writing as interrelated skills that begin development simultaneously at birth, thus emphasizing the critical role of children's home environments in the development of these skills. In contrast, other literacy models gave priority for learning to read and write to the schools, where literacy skills are taught using formal, sequenced, and direct instruction.

### Emergent Literacy Components

This review of the literature highlights and describes three key emergent literacy components: emergent writing, alphabet knowledge, and phonological awareness. Results of two early reviews (Snow, et al., 1998; Whitehurst & Lonigan, 1998) and the recent National Early Literacy Panel (NELP) systematic review and meta-analysis (NELP, 2008) support the importance of these specific components to later reading achievement.

## Importance of Emergent Writing, Alphabet Knowledge and Phonological Awareness to Literacy Outcomes

The National Research Council's Panel on preventing reading difficulties in young children conducted the first large-scale narrative review to examine the effectiveness of interventions for young children at risk for later literacy difficulties (Snow, et al., 1998). The Panel identified weaknesses in oral language, phonological awareness (PA), and alphabet knowledge (AK) as necessary target areas for the prevention of significant reading problems. Similarly, Whitehurst and Lonigan (1998) published a narrative summary of the literature on emergent literacy. They argued that phonemic awareness, letter knowledge, and emergent writing, among others, are essential components of early literacy that aid in the development of conventional literacy skills. Both Snow, Burns, and Griffin's 1998 report and Whitehurst and Lonigan's (1998) review share the limitations of narrative reviews.

Narrative reviews are frequently criticized for being biased. Typically, they only review the evidence or literature that is available to the writer, which often results in a biased sample of the full range of literature about a particular topic. Further, because the search strategy and the criteria for including some studies and excluding others are not explicitly stated a priori, it is not possible for a third party to replicate the review (Davies, 2000; Torgerson, 2003). In contrast, a systematic review is defined as a "systematic, rigorous and exhaustive search of all the relevant literature" (Davies, 2000, p. 367). It differs from a narrative review in at least three ways. First, a systematic review begins with a clearly stated research question or hypothesis. Although a narrative review may also start with a clearly stated research question or hypothesis, narrative reviews typically revolve around a general discussion of the subject without a stated research question or hypothesis. By starting with a clearly stated research question, a systematic review

allows for a well-focused review that asks relevant questions (Petticrew, 2001). Second, a systematic review explicitly states inclusion and exclusion criteria. Because the reasons for rejecting particular studies are explicitly stated, the resultant findings are less susceptible to various forms of bias, such as selection and publication bias. In addition, the explicit specification of the procedures and criteria used in the review permits the findings to be open to comment, criticism, and change by other reviewers (Torgerson, 2003). Finally, a systematic review attempts to identify all available evidence, both positive and negative. By including both positive and the negative evidence, a systematic review enables readers to make judgments based on the totality of evidence. For these reasons, systematic reviews are often regarded as the “gold standard” in research synthesis and represent a more sophisticated and rigorous type of synthesis.

In 2002, the National Early Literacy Panel (NELP) enhanced the knowledge base on emergent literacy by conducting a systematic review and meta-analysis, which provided an empirical summation of all existing literature from 1887 to 2003. In particular, the NELP report focused on the precursor skills most predictive of later conventional literacy. Thus, the NELP report makes an important contribution to the existing literature, because it is the only systematic review and meta-analysis on emergent literacy.

The Panel was tasked with summarizing the evidence on early literacy development as well as on the impact of home and family influences on that development. One of the four research questions focused on the skills and abilities of young children (i.e. birth through five years of age or kindergarten), which were predictive of later reading, writing, or spelling outcomes. Results gleaned from 299 articles for review and analysis found ten variables that had at least a moderate zero-order relationship with at least one conventional literacy outcome. Of these ten variables, six were consistently related to later conventional literacy outcomes and were

predictive when other variables were controlled in multivariate analyses. These six variables included: alphabet knowledge (AK), phonological awareness (PA), rapid automatic naming (RAN) of letters and digits, RAN of objects and colors, writing or writing name, and phonological short term memory (STM). Three of these variables, writing or writing name, AK, and PA, are also domains considered to be aspects of emergent literacy. Results of the relevant analyses of these variables will be further explicated.

In the NELP systematic review and meta-analysis, writing/writing name focused on the “ability to write letters in isolation on request or write own name” (p.44), and alphabet knowledge (AK) focused on “knowledge of letter names or letter sounds” (p. 42). Phonological awareness (PA), on the other hand, involved the “ability to detect, manipulate, or analyze components of spoken words independent of meaning” (p. 43), with “components of spoken words” referring to individual sounds or groups of sounds. All three components showed statistically significant correlations with decoding, comprehension, and spelling. Table 1 summarizes the results of the analyses. Of the ten variables considered by the Panel, writing/writing name, AK, and PA surfaced as important, reliable, and stable predictors of later conventional literacy outcomes and will be the focus of this review of the literature.

Table 1: Results of Analyses for AK, PA, and Writing

<b>Variable</b>	<b>Literacy Outcome</b>	<b><i>r</i></b>	<b>95% CI</b>
Writing	Decoding	0.49	[0.45, 0.53]
Writing	Spelling	0.36	[0.27, 0.44]
Writing	Comprehension	0.33	[0.26, 0.41]
AK	Decoding	0.50	[0.48, 0.52]
AK	Spelling	0.54	[0.51, 0.57]
AK	Comprehension	0.48	[0.45, 0.51]
PA	Decoding	0.40	[0.39, 0.42]
PA	Spelling	0.40	[0.37, 0.44]
PA	Comprehension	0.44	[0.41, 0.48]

*Note.* CI = confidence interval

### Emergent Writing

In this section, emergent writing will be defined and explained. Next, frameworks of emergent writing development will be explored, followed by a discussion of the development of emergent writing skills in typically developing children and children with LI. With regard to the development of emergent writing in typically developing children, name writing and the development of writing skills beyond the name and single words will be examined; whereas, only name writing skills will be examined in children with LIs.

## Defining Emergent Writing

Emergent writing is a broad construct that includes the marks that children make on paper, the meanings they attach to those marks, and the social contexts in which writing takes place (Clay, 1975; Rowe, 2008). Long before children begin formal schooling, they demonstrate knowledge about the features of writing. For example, Gibson and Levin (1980) gave children, ranging in age from 15 to 18 months, paper attached to a board and one of two tools. The tools were identical except that one left a trace and the other did not. All children spent significantly more time scribbling when given the tool that left a trace. In addition, the children often pointed to or named the scribbles produced by the writing tool but did not do so when the tool did not leave a trace. According to Tolchinsky (2006), a basic feature of writing is that it leaves a trace, and children develop understanding of this feature spontaneously. Young children's writing also reflects universal features of writing, such as linearity, presence of distinguishable units, regularity of blanks, and directionality (Gibson & Levin, 1980; Gombert & Fayol, 1992). Thus, it appears that children develop some knowledge about the features of writing spontaneously (Brenneman, Massey, Machado, & Gelman, 1996; Tolchinsky, 2006).

Some early researchers suggested that children's writings are "a random stringing together of letters of the alphabet which the speller is able to produce in written form" (Gentry, 1982). Many now agree that children use letters and scribbles to convey meaning through print. For example, Gombert and Fayol (1992) found that children as young as three differentiate writing from drawing and from age 40 months, they vary the size of discrete written units to match the size of the verbal activity they are writing about. Further, children appear to approach the task of writing differently than they approach the task of drawing. Brenneman, Massey,



Machado, and Gelman (1996) videotaped 48 preschool aged children who were shown picture cards and asked to both draw and write the name of the pictured object. When children were asked to write, they stated that they did not know how to write and sounded out letter-sounds significantly more often than when they were asked to draw. In terms of their productions, children filled in and scribbled significantly more when drawing than when writing. Further, significantly more children rotated their papers when drawing than when writing. These results demonstrate that children have some understanding of the difference between writing and drawing and evidence these differences in the writing they produce and in the way they approach each task.

### Frameworks of Emergent Writing Development

While a majority of the more recent research on emergent writing has focused on name writing and single word writing, early researchers proposed frameworks to describe how children acquire writing skills more generally. Luria and Hildreth were two of the earliest researchers to suggest that children pass through stages of writing development (Hildreth, 1936; Luria, 1929/1978), moving from undifferentiated “scrawls” into differentiated “signs”. Since their early work, several other researchers have examined young children’s emergent writing and have proposed various developmental frameworks (Ferreiro & Teberosky, 1982; Lieberman, 1985; Tolchinsky, 2003). Arguably, Tolchinsky (2003) provides the most complete representation of developmental writing stages. Her framework evolved from synthesizing findings across various research studies, including a wide range of writing tasks (e.g., name writing, writing words, and

writing sentences) completed by children from preschool through second grade. Tolchinsky's (2003) developmental writing framework includes four stages. Stage 1, undifferentiated writing, describes children's writing according to universal features such as linearity, presence of distinguishable units, regularity of blanks, and directionality. Typically, the marks are organized around a horizontal axis and written toward the same direction (either right to left or left to right). During the period of undifferentiated writing, writers are the interpreters of the writing. They understand their own writing but not the writing of others.

During Stage 2, children generate certain criteria regarding the distinctive features that graphic displays must fulfill in order to be "readable". For example, a readable text must have a limited number and sufficient variety of characters. These two criteria also serve to limit the number and variety of characters children use in their own writing. As they apply these two conditions to their own writing, their writing becomes made up of a small number of distinguishable and manageable units. During Stage 2, children also begin to look for some correlation between the length of words or phrases and the number of marks they put on paper. In the beginning, this correlation is global. Gradually, they move toward more specific correspondences between parts of the utterance and the written text.

In Stage 3, children's writing goes through a process that Tolchinsky (2003) refers to as *phonetization*. Phonetization is the process by which writing becomes language-specific as children begin to discover letter-sound correspondences. The discovery of letter-sound correspondences marks a turning point in their writing development, because it provides a stable principle that they can use to represent any word. In some languages, such as Italian, Spanish, and Chinese, the syllable is the first unit of letter-sound correspondence children discover. Importantly, in Stage 3, children do not yet have fixed, stable letter-sound correspondences.

Therefore, children may use one letter or more than one letter to represent a sound depending on the structure of the words they are trying to write or whether they are trying to write a sentence versus a word.

In Stage 4, children discover the alphabetic principle or the understanding that phonemes are represented by letters in words. Further, the alphabetic principle stipulates that, regardless of the position in which a phoneme occurs in a word, it can be represented by the same letter. Children in this stage write a letter for each vowel and consonant in a word.

The original support for Tolchinsky's (2003) framework was limited, however, to a qualitative analysis of children's writing across various tasks. It did not provide quantitative evidence to support a developmental sequence for the acquisition of writing skills. More recently, Puranik and Lonigan (2009) have provided quantitative support. To more fully characterize the nature of writing development, Puranik and Lonigan designed a study to address the shortcomings of previous research. First, they included a range of writing tasks in their study, not just name writing. In this way, they attempted to better ascertain the overall writing abilities of young children. The tasks included were: writing letters, name, CVC words (i.e., words consisting of a consonant-vowel-consonant syllable shape), a picture description, and a sentence retell. For the writing letters task, children were asked to write ten uppercase letters (B, D, S, T, O, A, H, K, M, and C). For the writing of CVC words task, children were asked to write words with a syllabic structure of consonant-vowel-consonant (e.g., mat, bed, duck, cat, fell, and hen). In the picture description task, children were shown a picture of an event and asked to write a description of it. For the last task, sentence retell, children were asked to orally repeat and then write a sentence spoken by the examiner.

Second, Puranik and Lonigan (2009) developed a detailed scoring system that ordered and scored writing features according to how these features may appear developmentally. This detailed scoring system allowed the authors to empirically test Tolchinsky's (2003) developmental framework. A scoring rubric was developed for each task. For example, the writing name task rubric had nine features: linearity, segmentation, simple characters, left-to-right orientation, first letter of name, complex characters, random letters, many letters, and correctly spell first name. Each feature was scored 1 if the feature was present and 0 if the feature was absent. By developing a scoring system that could be used across future studies, Puranik and Lonigan claimed that comparisons and generalization of future findings would be more meaningful.

Using the five tasks, Puranik and Lonigan (2009) assessed 372 children, 36 to 60 months of age, and scored each writing sample using the specified scoring rubrics. Results revealed that 5-year-old children performed significantly better than 3-year-old children on all tasks. For *writing letters, name, and CVC word* tasks, the 5-year-old children scored significantly higher than the 4-year-old children, and the 4-year-old children scored significantly higher than the 3-year-old children ( $ps < .001$ ). Further, results from the name writing and composing tasks were submitted to the Guttman scaling procedure to determine whether a developmental writing sequence could be derived empirically. Results revealed a coefficient of reproducibility ( $C_R$ ) of .94 for the writing name task, a .99  $C_R$  for picture description 1 and both sentence retell tasks, and a .98  $C_R$  for picture description 2. These results provide evidence that children acquire writing features sequentially, as the  $C_R$  for each task was greater than .90. Therefore, the results support the following developmental writing sequence: (1) linearity, (2) segmentation, (3) simple

characters, (4) left-right orientation, (5) complex characters, (6) random letters, and (7) invented spelling.

### Development of Emergent Writing in Typically Developing Children

This section explores the development of emergent writing in typically developing children. More specifically, it examines how typically developing children acquire name writing skills as well as skills beyond name and word writing. Of the emergent writing tasks, name writing has been the most frequently studied (Puranik & Lonigan, 2009). Thus, additional information is included on how name writing develops, its significance within the developmental sequence of emergent writing, and its influence on early spelling patterns.

#### Development of Name Writing

In the acquisition of name writing, children follow a developmental sequence that is consistent across alphabetic languages such as Dutch, Spanish, Hebrew, and English (Bloodgood, 1999; Ferreiro & Teberosky, 1982; Lieberman, 1985). Several researchers have examined the name writing abilities of children of various ages, preschool through first grade, and proposed similar developmental sequences (Ferreiro & Teberosky, 1982; Lieberman, 1985; Saracho, 1990). All are as follows: (1) scribbling; (2) linear scribbling; (3) separate symbols;

(4) correct letters and pseudo-letters; (5) generally correct name, with some letter omissions or reversals; and (6) correctly written name.

In one of the first studies of developmental changes in name writing, Ferreiro and Teberosky (1982) examined the name writing abilities of 30 first grade children and proposed five levels of name writing. In Level 1, children cannot write their own names; instead, they produce written strings with a variable number of graphic characters. In Level 2, children attempt to discover a one-to-one correspondence between each letter and a part of their full name; and, by Level 3, they rely on the “syllabic hypothesis” to write their names. The syllabic hypothesis requires children to shift to a correspondence between individual letters and syllables rather than rely on a correspondence between individual letters and parts of names, as in Level 2. Level 4 is a crucial stage in children’s name writing development. It marks the transition from the syllabic to the alphabetic hypothesis. In this stage, children realize the need for an analysis that goes beyond the level of the syllable. They now understand that a letter represents a sound value smaller than a syllable. At Level 5, alphabetic writing emerges as children “break the code”, and begin to systematically analyze the letter-sound relationship of the phonemes in the words they are writing.

Both Lieberman (1985) and Sacharo (1990) examined the name writing abilities of preschool children. To date, Lieberman’s (1985) study is perhaps the most comprehensive study of name writing for preschool children. She followed 47 preschool students, who ranged in age from 36 to 59 months over the course of a school year and collected a total of 454 name writing samples (i.e., an average of 9.7 per child). Results revealed 16 transitions children pass through as they learn how to write their names. These transitions were clustered into four “moments” or logical groupings based on changes in name writing development. The moments define a period

of time when children learn particular literacy concepts. In other words, children move from one moment to the next as they refine their name writing knowledge. Moment One involves demonstrating an understanding that writing and drawing are distinct representational systems. During Moment Two, zigzag scribbles first appear, and later the production of separate letter-like graphemes. Moment Three involves learning the distinctive features of the letters in their own names. During Moment Three, children may use “placeholders” (e.g., letter-like graphemes or dots) to take the place of letters they do not yet know. Finally, in Moment Four, children begin to represent all letters in their first and last names.

Sacharo (1990) also examined the name writing abilities of preschool children; however, she focused exclusively on 3-year-old children. In her study, she examined the name writing abilities of 50 3-year-old children and proposed a five-level developmental model of the acquisition of name writing skills. The following five levels were included in the model: (1) scribbling; (2) horizontal scribbling; (3) discrete units; (4) letters; (5) correct spelling.

The results from the various studies all demonstrate that children who speak an alphabetic language progress through similar developmental stages in learning to write their names. Children first learn that writing and drawing are different systems and eventually arrive at the correct spelling of their first names.

### First and Most Advanced Writing Skill

A common finding in the name writing literature reveals that children are able to demonstrate their most advanced skills when asked to write their name but will use writing

characteristic of earlier levels when asked to complete more difficult writing tasks, such as word, sentence, or story writing (Bloodgood, 1999; Bus et al., 2001; Levin, Both-de Vries, Aram, & Bus, 2005). Typically, name writing ability is the first emergent writing skill to develop and the most advanced writing skill. In a series of three studies, Levin, Both-de Vries, Aram, and Bus (2005) examined the writing abilities of 243 children who ranged in age from 35 to 59 months. Children were asked to write their names and four to eight dictated words. Children's writing was scored on a 13-point scale ordered from scribbling (score of 0) to conventional spelling (score of 13). Results from Wilcoxon matched-pairs signed-ranks tests showed that more children scored higher on the name writing task than on dictated words in each age group across all studies ( $p < .001$ ). Additionally, the gap between name writing skill and word-writing skill increased with age ( $p < .004$ ), suggesting that children made more progress in their name writing abilities than in their word-writing abilities through age 54 months.

Name writing skills also tend to be more advanced than other writing skills. Bloodgood (1999) assessed 56 preschool children who ranged in age from 36 to 60 months of age. Children were assessed twice during the school year on a variety of measures, including name writing, color knowledge, alphabet knowledge, word-writing, reading ability, phonological awareness, and story-writing. When comparing name writing scores to word-writing scores, 4-year-old children scored an average of 4.74 on a 7-point scale on the name writing task and an average of 1.37 on a 5-point scale on the word-writing task; whereas, 5-year-old children scored an average of 4.75 on the name writing task and an average of 1.15 on the word-writing task. These results must be interpreted with caution, because the scales used to evaluate the two writing tasks were different and statistical comparisons were not conducted. Nevertheless, the results provide early



evidence that suggests children are able to write their names at a more advanced level than they are able to write other words.

In a series of case studies, Bus and her colleagues (Bus et al., 2001) examined 4- and 5-year old children's ability to write a story. In the first study, younger kindergarten children (64-70 months) were able to write their own names and knew some letters (Level 5) prior to the start of the study. When asked to write a story, six of the eight children produced writing that only included early-appearing forms, such as pseudo-cursive scribble (Level 1) and random letter strings (Level 2). A multiple matched-pair Wilcoxon test revealed that writings containing only early-appearing forms occurred more often than writings consisting solely of invented spelling ( $p < .05$ ). In the second study, older kindergarten children (70-78 months) were also asked to write stories. Similar to the first study, children in the second study produced more texts that contained only early-appearing forms than stories that contained only invented spelling ( $p < .05$ ). In addition, once children began to use alphabetic writing, they were more likely to use alphabetic writing combined with early-appearing forms than to use only alphabetic writing ( $p < .05$ ). These results demonstrate that children who can write their names at an advanced level may resort to earlier levels of writing when attempting to write other kinds of texts.

In one of the largest studies on emergent writing, Puranik and Lonigan (2009) assessed 372 children, 36 to 60 months of age on five different writing tasks (letters, name, words, picture description, sentence retell) and scored each writing sample using a rubric designed for each specific task. When comparing name writing to other tasks, both 4- and 5-year old children were able to write their names at a more advanced level than they were able to write words or sentences. Specifically, 4-year-old children averaged a score of 7.23 on the name writing task (possible score of 9), 15.85 on the word-writing task (possible score of 42), 1.76 on the picture

description tasks (possible score of 7), and 3.27 on the sentence retell tasks (possible score of 7). Five-year-old children averaged a score of 8.09 on the name writing task, 20.04 on the word-writing task, 2.10 on the picture description tasks, and 3.71 on the sentence retell task. In addition, 78.6% of the 4-year-old children and 90.1% of the 5-year old children were able to write the first letter of their first name. When examining their ability to write the first letter of a word, results across the six words ranged from 10.4 to 13.9% for the 4-year-old children and from 12.8 to 27.0% for the 5-year-old children. Both 4- and 5-year-old children were more likely to be able to write the first letter of their first name than the first letter of other words. Although statistical comparisons examining the differences between the levels of name-writing and word-writing were not conducted, these results suggest that children are able to write their names at a more advanced level than they are able to write other words.

Taken together, the results from the various research studies support the conclusion that name writing develops before other kinds of writing (Levin et al., 2005). In addition, name writing skills tend to be more advanced than other writing skills (Bloodgood, 1999; Bus et al., 2001; Puranik & Lonigan, 2009).

### Name writing and Early Spelling

Several studies have shown that name writing influences early spelling patterns. In particular, children tend to use the letters in their own names as a starting point for phonetic spelling (Bloodgood, 1999; Gombert & Fayol, 1992; Treiman, Kessler, & Bourassa, 2001). In an early study, Gombert and Fayol (1992) had 48 children (ages 34 to 70 months) write their

names, three pairs of nouns, and eight sentences. In a summary of their findings, the authors noted that 4- to 5-year old children were most likely to produce writings that included at least 70% of the letters in their own names. Specifically, ten of the 16 4- to 5-year olds and six of the 16 5- to 6- year olds used this strategy; whereas, none of the 3- to 4- year old children did so.

Similarly, Bloodgood (1999) and Treiman, Kessler, and Bourassa (2001) examined the specific letters and letter patterns that children, ranging in age from 48 to 96 months, used when writing words. Results from both studies found that children were more likely to use the letters contained in their own names when spelling other words than to use letters not included in their names. Specifically, chi-square analyses revealed that children whose name contained *l*, *n*, *r*, or *s* used those letters when writing other words significantly more frequently ( $p < .001$ ) than did children who did not have those letters in their names (Bloodgood, 1999). Further, kindergarten children were more likely ( $p < .001$ ) to use the letters in their own names when spelling other words than first or second grade children (Treiman, et al., 2001).

Research has also demonstrated that name writing provides the starting point for phonetic writing (Both-de Vries & Bus, 2010; Both-de Vries Anna & Bus, 2008) In a series of studies, Both-de Vries and Bus (2008, 2010) examined the specific letters children, ages 38-75 months, used when they first began to use phonetic writing. Results demonstrated that children who were able to write their own names used the first letter of their first name more frequently in all words they wrote ( $p < .01$ ), as well as in words that contained that letter ( $p < .001$ ), when compared to children who were unable to write their names (Both-de Vries & Bus, 2010).

In conclusion, research on name writing supports three specific findings. First, children acquire name writing according to a developmental sequence. They demonstrate their most advanced skills when asked to write their names but use writing characteristic of earlier levels

when asked to complete more difficult writing tasks, such as word, sentence, or story writing (Bloodgood, 1999; Bus et al., 2001; Bus et al., 2005; Puranik & Lonigan, 2009). One reason that children may develop name writing skills at an earlier and more advanced level may be that writing one's own name is particularly motivating and rewarding. According to Martens (1996), "no matter...how much writing children do, nothing is as personal, significant, and constant for them as writing their own name" (p. 69). Finally, research demonstrates that name writing influences early spelling patterns. Children use the first letter of their first name as a starting point for phonetic writing (Both-de Vries & Bus, 2008; Both-de Vries & Bus, 2010).

#### Development Beyond Name- and Word-Writing

Most research on emergent writing has focused on name writing or spelling single words (Puranik & Lonigan, 2009). Few studies have examined young children's spontaneous writing; however, the limited data available suggest that children use the superordinate features of writing (e.g. linearity, presence of units, and regularity of blanks) from 4-years of age on. As tasks become more challenging, such as in story writing, children may use earlier-developing forms (Bus, et al., 2001; Jensen, 1990; Tolchinsky-Landsmann & Levin, 1985).

Tolchinsky-Landsmann and Levin (1985) asked 42 children ages 40 to 68 months to write their names, and then to both draw and write four utterances. Writing samples were scored on five superordinate features: linearity, presence of units, regularity of blanks, constricted size relative to drawing, and number of characters. An age by utterance ANOVA revealed a significant increase with age in the presence of the superordinate features ( $p < .001$ ). A Scheffe

post-hoc analysis showed that only the 3-year-old children differed from the 4- and 5-year olds, who were not statistically different from one another. Thus, these data suggest that by 4-years of age children are able to represent the superordinate features of the writing system in the writings they produce.

Similarly, Jensen (1990) asked 16 children, who ranged in age from 56 to 68 months, to complete four writing tasks: story drawing-writing, story writing using a wordless picture book, letter writing, and spontaneous word-writing. Children's writing was analyzed using a 9-point scale that included: (1) use of uppercase letters, (2) use of lowercase letters, (3) first name with some correct letters, (4) other's names with some correct letters, (5) words with some correct letters, (6) consistent left-right directionality, (7) consistent top-bottom directionality, (8) structuring of the page for a list, and (9) structuring of the page for a story. Findings were similar to those of Tolchinsky-Landsmann, and Levin (1985). Results revealed many of the children evidenced superordinate features of the writing system in their productions. Specifically, 69% of the children consistently used left-right directionality; 44% consistently used top-down directionality; and 69% began writing in the top left corner of the paper.

When combined with the findings on name writing, three conclusions emerge from the data. First, name writing is the earliest written form to appear. As children acquire name writing skills, they pass through a developmental sequence; however, they do not strictly move from one developmental level to the next. Rather, they demonstrate writing skills characteristic of different levels depending on the nature of the writing task (e.g., name writing, writing single words, or writing a story). Finally, children typically write their names at a higher level than they write other words or stories.

## Development of Emergent Writing in Children with Language Impairment

Cabell, Justice, Zucker, & McGinty (2009) conducted the only research study to date examining the emergent writing abilities of children with LI. Results of this study revealed that children with LI demonstrate a significant amount of variance in name writing abilities and less advanced name writing abilities when compared to their same-aged peers. In the first of a two-part study, 59 children diagnosed with LI, who ranged in age from 48 to 60 months, wrote their names. The samples were scored using a 14-point scale adapted from Lieberman (1985). Results revealed a significant amount of variance in name writing ability. Of the participants, 42% were unable to write any recognizable letters in their names; whereas, 44% wrote at least one recognizable letter, and 14% wrote all of the letters in their names.

In the second part of the study, 23 children with LI were matched to typically developing children on the basis of age and SES. Results from ANOVAs revealed that typically developing children demonstrated significantly more advanced name writing representations than children with LI ( $p < .01$ ), and the difference was consistent with a very large effect size ( $d = 1.31$ ; CI: .68 – 1.95). On average, children with LI were able to represent 26.8% of the letters in their names; whereas, children developing language typically were able to represent an average of 83.7% of the letters in their names. Finally, the authors classified each writing sample into one of the four moments described by Lieberman (1985) included in the section on Development of Name Writing on pages 26 and 27. Briefly, a moment defines a period of time when children learn particular literacy concepts. As children develop their writing skills, they move from Moment One to Moment Four. Table 2 shows the percentage of writing samples classified into each moment for each group of children.

Table 2: Name Writing Representations across Moments

	Language Impaired	Typical Language
Moment 1	26.1%	4.3%
Moment 2	21.7%	4.3%
Moment 3	47.8%	26.1%
Moment 4	4.3%	65.2%

Table 2 clearly illustrates that most of the children with typical language produced name writing samples that were classified as a Moment 4. In other words, they were able to represent all of the letters in their names. In addition, very few children with typical language produced samples that were classified as Moment 1 or 2, which are earlier-developing forms such as zigzag scribbles and letter-like graphemes. In contrast, most of the children with LI produced name writing samples that were classified as a Moment 3. These children used placeholders (e.g., letter-like graphemes or dots) for letters they did not know. Further, very few of the children with LI produced samples that were classified as Moment 4.

### Phonological Awareness

Phonological awareness (PA), the second emergent literacy component identified by the NELP (2008) as crucial for later literacy success, will be discussed in this section. The PA research base dates back to the 1970's. A plethora of studies have examined the various

components of PA, proposed theories about the nature of PA knowledge, and put forward several developmental models. A comprehensive review of this literature is beyond the scope of this chapter; however, such reviews exist in Adams (1990), Gillon (2004), the Report of the National Reading Panel (National Institute of Child Health and Human Development, 2000), the Report of the National Early Literacy Panel (NELP, 2008), and Snow et al. (1998). In a review of phonological awareness, Troia (2006) noted that PA is “one of the most well-researched phenomena in cognitive psychology” (p. 271). To date, the research clearly demonstrates that PA is critical to the development of later literacy skills, including reading comprehension, word recognition, spelling, and writing, (Bradley & Bryant, 1983; Lundberg, Olofsson, & Wall, 1980; Share, Jorm, Maclean, & Matthews, 1984). In this section, phonological awareness will be defined, followed by a review of theoretical models and the developmental sequence of PA in English-speaking children. Finally, the section will conclude with a review of PA skills in preschool children with LI.

### Defining Phonological Awareness

Although phonological awareness (PA) can be defined simply as awareness of the sound structure of spoken words, the term often has been used interchangeably with other terms such as “phonological processing”, “phonics”, “metalinguistic awareness”, and “phonological sensitivity”, among others. Further, numerous definitions of phonological awareness have been proposed in the literature. For example, Morais (1991) restricted the meaning to include only phoneme level skills. Others (Treiman, 1983, 1985) employed a broader definition including all



subsyllabic (e.g. onset and rime) as well as phonemic level skills. Stanovich (1992) defined PA as “phonological sensitivity” that exists along a continuum from “shallow” sensitivity to large phonological units on one end to “deep” sensitivity of small units (p. 317) on the other.

To address the debate regarding the exact definition of phonological awareness, Anthony and Lonigan (2004) analyzed data from four different research studies, which included children who varied in age from preschool through second grade. The goal of their analysis was to ascertain whether rhyme sensitivity was empirically distinguishable from phonemic awareness, segmental awareness, and global phonological sensitivity. Each study used a variety of tasks to assess blending and segmentation abilities at both the syllable and phoneme levels and onset-rime knowledge. Confirmatory factor analysis (CFA) ascertained whether a one-factor model (in which rhyme sensitivity is part of phonemic awareness, segmental awareness, and phonological sensitivity) or a two-factor model (in which rhyme sensitivity is separate from phonemic awareness, segmental awareness, and/or phonological sensitivity) would provide the most appropriate fit for the data. Results led Anthony and Lonigan to conclude that, “sensitivity to rhyme and sensitivity to other linguistic units are not distinct phonological abilities” (p. 51). They go on to state “phonological sensitivity is a single ability that can be measured by a variety of tasks (e.g., detection, blending, and elision) that differ in linguistic complexity (e.g., syllables, rimes, onsets, and phonemes)” (p. 51). As a result of Anthony and Lonigan’s work, phonological awareness will be defined in this chapter as awareness of the sound structure of spoken words. It is a multilevel skill composed of syllable awareness, onset-rime awareness, and phoneme awareness and belongs to a subset of skills within the larger construct of phonological processing and metalinguistic knowledge.

## Theoretical Perspectives of Phonological Awareness

Research with school-age children demonstrated that phonological awareness (PA) is one component of a larger construct called phonological processing abilities (PPA). Figure 1, adapted from Gillon (2004, p. 10), visually represents the construct of PPA.

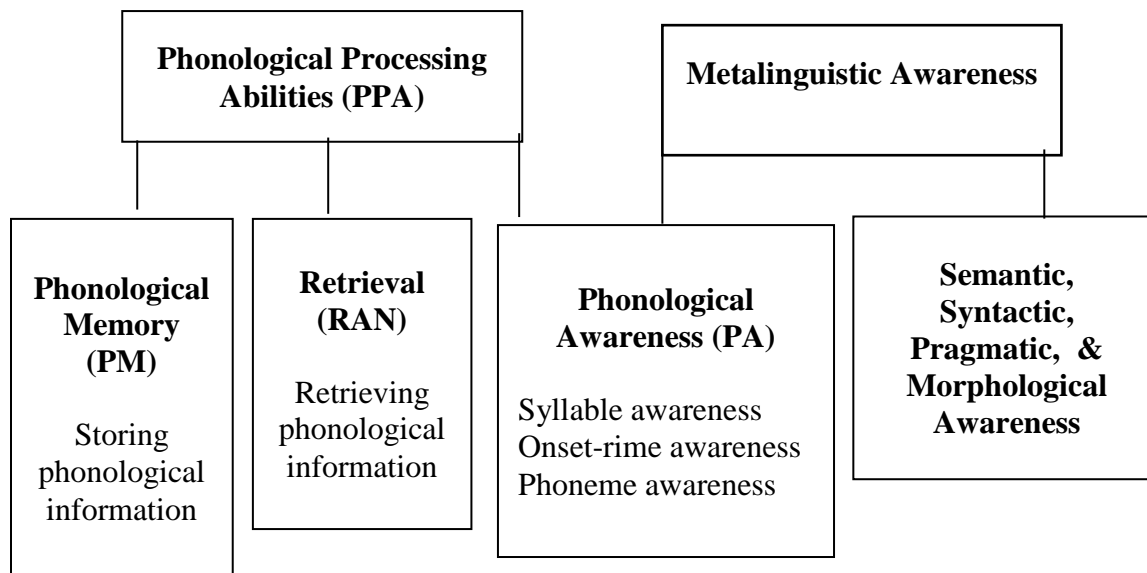


Figure 1: Schematic of Phonological Processing Abilities

PPA are composed of three separate but moderately correlated domains that include phonological awareness (PA), phonological memory (PM), and retrieval abilities (de Jong & Vander Leij, 1999; Sprugevica & Hoiem, 2004; Wagner & Torgesen, 1987; Wagner, Torgesen, Laughon, Simmons, & Rashotte, 1993; Wagner, Torgesen, & Rashotte, 1994; Wagner et al., 1997). Of these domains, PA tends to be the strongest predictor of individual differences in word reading, with PPA exerting their greatest influence during the first few years of schooling

(de Jong & Van der Leij, 1999; Sprugevica & Hoiem, 2004; Wagner & Torgesen, 1987; Wagner, et al., 1993; Wagner, et al., 1994; Wagner, et al., 1997). When compared to the research on school age children, much less is known regarding the nature of preschool children's PPA (Anthony, Williams, McDonald, & Francis, 2007). The report of the National Early Literacy Panel (2008) found that all three PPA components were reliable predictors of school-age decoding, comprehension, and spelling skills. Therefore, understanding the nature of PPA, how these skills are interrelated, and how these skills work together with the other areas of emergent literacy to support literacy acquisition, is particularly important.

Research examining the nature of phonological processing abilities (PPA) in preschool children has uncovered conflicting findings (Anthony et al., 2006; Anthony, et al., 2007; Lonigan et al., 2009; Wagner et al., 1987). Wagner et al. (1987) and Lonigan et al. (2009) examined PPA in 544 preschool children who ranged in age from 27 to 71 months. Using confirmatory factor analysis, Wagner et al. and Lonigan et al. reported good fit given multiple fit indices for a two-factor model. These findings support the conclusion that a two-factor model, wherein phonological awareness and phonological memory are combined in a single factor with retrieval as a separate factor, is the best way to describe the nature of PPA in preschool children.

In contrast, Anthony et al. (2006) and Anthony et al. (2007) concluded that a three-factor model was the best way to characterize PPA in preschool children. In the three-factor model, phonological awareness, phonological memory, and retrieval are separate factors. In these studies, 536 children who ranged in age from 43 to 67 months were assessed on a variety of tasks measuring phonological awareness, phonological memory, phonological access, letter knowledge, text discrimination, word reading, and general cognitive ability. Results from

confirmatory factor analysis (CFA) revealed good fit given multiple fit indices (Anthony, et al., 2006; Anthony, et al., 2007) in support of a three-factor model.

Two reasons may explain these contradictory findings. First, Anthony and colleagues (Anthony, et al., 2006; Anthony, et al., 2007) controlled for the influence of general cognitive ability; whereas, Lonigan et al. (2009) did not. Anthony et al. (2007) reported that a significant amount of the correlations among PPA were due to general cognitive ability. Specifically, PA and PM shared a correlation of .68 ( $p < .001$ ). When general cognitive ability was partialled out, the correlation between PA and PM was reduced to .15. Lonigan et al. (2009) reported a correlation of 1 between PA and PM and did not control for the influence of general cognitive ability. Therefore, it seems plausible that some of the reported relationship between phonological memory and retrieval could be accounted for by general cognitive ability.

Second, Anthony et al. (2007) suggested that the differences in the findings could be due to improved sensitivity of the phonological processing measures. In the Wagner et al. (1987) study, the tasks did not use picture support, resulting in more difficult tasks. Without picture support, children were required to hold phonological information in memory while performing the task. Similarly, Lonigan and colleagues (2009) only used picture support in four of the eight phonological awareness tasks. All of the tasks in the Anthony et al. study gave children a choice of four illustrated pictures, reducing the memory load while children performed the PA task.

According to Anthony et al., the use of pictures results in

more sensitive measures that tap a broader range of phonological awareness ability. While tasking memory to a lesser degree and measuring lower levels of phonological awareness ability, these types of tests have been demonstrated to measure the same latent phonological ability as more traditional measures of phonological awareness. (p. 133).

Results obtained using more sensitive measures and controlling for the effects of general cognitive ability suggest a three-domain model as the best characterization of the nature of PPA in preschool children. This three-domain model includes PA, PM, and retrieval as separate yet correlated factors and is consistent with findings from school-age children.

### Development of Phonological Awareness in Typically Developing Children

In a seminal study of the development of phonological awareness skills, Lonigan, Burgess, Anthony, and Barker (1998) examined 356 children, who ranged in age from 25 to 70 months. All children completed four tasks: rhyme oddity detection, alliteration oddity detection, blending, and elision. For purposes of data analysis, the authors created eight groups of children. They included a middle-income and lower-income group at four age levels: 2, 3, 4, and 5 years. A series of ANCOVAs using age, receptive language score, and expressive language score as covariates revealed age-related performance differences on all tasks, with older children performing significantly better than younger children. Of particular importance is the observation that phonological sensitivity proceeds from lower (i.e., syllables) to higher skill levels (i.e., phonemes), with lower skill levels serving as developmental precursors to higher skill levels of phonological sensitivity.

Since the findings reported by Lonigan et al. (1998) were published, other large-scale studies have also reported a developmental sequence in the acquisition of phonological awareness skills that proceeds from awareness of larger units (e.g., syllables) to smaller units (e.g., phonemes). For example, Anthony, Lonigan, Driscoll, Phillips, and Burgess (2003) tested 947 children who

ranged in age from 24 to 72 months using a variety of blending and elision skills at four levels of linguistic complexity (word, syllable, onset/rime, and phoneme). Results from hierarchical log linear analyses (HLA) examining the order of acquisition of phonological awareness skills demonstrated that children learned to manipulate word level skills before syllable level skills, syllable level skills before onset-rime level skills, and onset-rime level skills before phoneme level skills. With respect to the order of acquisition of skills within a particular level of linguistic complexity, the results indicated that children could blend phonological information before they could elide phonological information. Importantly, this study was the first to examine developmental patterns in the acquisition of phonological sensitivity skills. Results from fits of symmetry models using HLA revealed that a strict stage model in which children mastered one set of skills before learning skills at the next stage was not consistent with the data. Specifically, when examining cell frequencies of earlier and later developing skills, mastery of earlier skills was not necessary for achieving at least moderate amounts of subsequent skills as evidenced by non-zero cell frequencies.

In a narrative review of studies examining the developmental progression of phonological sensitivity, Pufpaff (2009) also suggested a sequence that proceeds from phonological awareness to phonemic awareness. Similar to Anthony et al. (2003) and Lonigan et al. (1998), Pufpaff suggested that children's phonological awareness progresses from words to syllables to phonemes. At both the syllable and phoneme levels, children progress by initially developing blending skills and moving next to isolation skills, followed by segmenting skills and, finally, to elision skills.

Taken together, the results of Lonigan et al. (1998), Anthony et al. (2003), and Pufpaff (2009) support a developmental progression in the acquisition of phonological awareness skills

that proceeds from less complex linguistic units to more complex linguistic units both within and across varying levels of linguistic complexity. Within a particular level of linguistic complexity, children typically demonstrate competence with blending skills first, followed by competence with isolation tasks, segmentation tasks, and finally, competence with elision tasks. Across varying levels of linguistic complexity, children typically demonstrate competence with word level skills first. Next, children become increasingly successful with syllable-level skills, followed by onset-rime level skills, and lastly, phoneme-level skills. Finally, these results do not support a strict stage theory of phonological awareness in which one stage must be mastered prior to progression to the next stage. Rather, these results point to the acquisition of phonological skills in an overlapping pattern and demonstrate that children learn and refine a variety of phonological awareness skills simultaneously. For example, children who demonstrate some proficiency at blending onsets with rimes may also be learning how to blend phonemes.

#### Development of Phonological Awareness in Children with Language Impairment

Several studies have consistently reported that preschool children with LI do not perform as well as their typically developing peers on a variety of phonological awareness tasks, including segmentation, rhyming, and initial and/or final sound identification (Boudreau & Hedberg, 1999; Kamhi, et al., 1985; Laing & Espeland, 2005; Magnusson & Naucler, 1990; Thatcher, 2010; Vandewalle, Boets, Ghesquiere, & Zink, 2010). In two studies on segmentation (Kamhi, et al., 1985; Magnusson & Naucler, 1990) children, who ranged in age from 3 years

through fourth grade, engaged in segmenting sentences into words, words into syllables, and words into phonemes. Both studies reported that children with LI performed significantly worse across all tasks when compared to typically developing peers matched for chronological age, language age, or mental age. When segmenting sentences into words, children with LI scored an average of 5.9 (out of a possible 26); whereas, children matched for language age averaged 12.3, and children matched for mental age averaged 18.6 (Kamhi, et al., 1985).

Thatcher (2010) examined the development of segmentation skills in preschool, kindergarten, and first grade children. A total of 90 children participated in the study, 15 per grade level, per language status group. All children were asked to identify whether pairs of one- and two-syllable words had the same initial sound, onset, or syllable. ANOVAs revealed significant main effects for grade ( $p < .001$ ), language status ( $p < .001$ ), and phonological awareness task ( $p < .001$ ). For the typically developing children at each grade level, syllable segmentation was easier than onset/rime and phoneme segmentation, and onset/rime segmentation was easier than phoneme segmentation. In addition, a significant language status by phonological awareness task interaction ( $p < .001$ ) indicated that children with LI performed worse on the onset/rime and syllable level tasks. Finally, no significant differences were found between typically developing children and children with LI on the phoneme-level task, as both groups seemed to find this task particularly difficult. These results demonstrate that typically developing children were more successful at segmenting one- and two- syllable words at the onset/rime and syllable levels than children with LI. Further, children with LI demonstrated the same developmental sequence found for typically developing children; they were more successful with syllable segmentation than onset/rime segmentation.



Several studies have examined preschool children's rhyming skills, including identifying rhyming and non-rhyming words and producing rhyming words when given a target word (Magnusson & Naucler, 1990; Boudreau & Hedberg, 1999; Laing & Espeland, 2005; Vandewalle, et al., 2010). In these studies, children with LI scored significantly worse than their typically developing peers matched for age, gender, and socioeconomic status. Vandewalle et al. (2010) reported that children with LI scored an average of 7.9 (out of a possible 12) on an end rhyme identification task compared to an average score of 10.4 for typically developing children. Similarly, Boudreau and Hedberg (1999) reported that children with LI scored 2.22 (out of a possible 10) on a rhyme production task and 6.39 (out of a possible 13) on a rhyme identification task, compared to average scores of 8.06 and 10.89, respectively, for their typically developing peers.

Finally, Laing and Espeland (2005) and Vandewalle et al. (2010) examined preschool children's ability to identify initial sounds of words and words with the same initial or ending sounds. In both studies, children with LI scored significantly lower than their typically developing peers. On Laing and Espeland's 40-item categorization task, children with LI correctly identified 23% of words with the same initial sound ( $M=22.8$ ;  $SD=2.8$ ); whereas, typically developing children identified 36% ( $M=35.6$ ;  $SD=2.8$ ). Vandewalle et. al (2010) also noted significantly poorer performance by children with LI on initial and final sound identity tasks ( $p<.008$  and  $p<.02$ , respectively).

## Alphabet Knowledge

Alphabet knowledge, also referred to as letter knowledge, represents one of the most critical literacy skills acquired by children during the preschool years (Adams, 1990). Many studies have consistently identified alphabet knowledge as a unique predictor of later reading skills, including reading comprehension, spelling, and decoding (Hammill, 2004; NELP, 2008) and as one of the most accurate predictors of later reading difficulties (Gallagher, Frith, & Snowling, 2000; O'Connor & Jenkins, 1999). In a study by Catts, Fey, Tomblin, and Zhang (2002), alphabet knowledge was the single best predictor of whether kindergarten children with LI demonstrated reading disabilities in second grade. This section will begin with a definition of alphabet knowledge and move to an exploration of theoretical perspectives underpinning the development of alphabet knowledge. Theoretical perspectives regarding developmental changes in the acquisition of upper- and lower-case letters will be explored separately as research supports different mechanisms underlying the acquisition of each letter set. Finally, the development of alphabet knowledge in typically developing children will be described, followed by a discussion of the development of alphabet knowledge in children with LI.

### Defining Alphabet Knowledge

Alphabet knowledge is one component of a larger construct called print knowledge or print awareness. Print knowledge involves learning about the rule-governed system of orthography and written language and includes print concept knowledge as well as alphabet

knowledge (Cabell, McGinty, & Justice, 2007; Justice, Bowles, & Skibbe, 2006). Print concept knowledge refers to the rules that govern the organizational properties of print (Justice, et al., 2006). In the beginning, print concept knowledge involves learning about the properties of books. In other words, books have authors, illustrators, covers, and pages. Then, print concept knowledge expands to learning about the print conventions that appear in books, such as right-to-left and top-to-bottom orientation of print, the first and last letters in a word, and the spaces between words (Cabell, et al., 2007). As children acquire additional knowledge, they move from these broad organizational properties about books and print to the specific knowledge of the units of print within a word, the letters of the alphabet.

Alphabet knowledge involves awareness of the distinctive features and names of individual letters as well as their letter-sound correspondences (Cabell et al., 2007; Justice, Pence, et al., 2006; McBride-Chang, 1999; NELP, 2008). The ultimate goal of alphabet knowledge is learning how to map sounds onto individual alphabet letters. Thus, alphabet knowledge represents a step along the way to achieving the alphabetic principle or understanding that a letter represents a speech sound (Cabell, et al., 2007; Levin, Shatil-Carmon, & Asif-Rave, 2006).

### Theoretical Perspectives of Uppercase Letter Acquisition

Four different theories exist to explain the order in which preschool children learn the names of individual uppercase alphabet letters. The Own-Name Advantage contends that alphabet letters that occur in children's first names are learned earlier than other letters, because

presumably children see the letters of their own names more frequently in written form than other letters. The effect is strongest for the first letter of children's first names and does not extend to their last names. This effect has been found for children in both kindergarten and first grade who speak a variety of alphabetic languages (Hoorens & Todorova, 1988; Nuttin, 1985, 1987; Treiman & Broderick, 1998).

The second theory, the Letter-Order Hypothesis, argues that children learn the letters that appear at the beginning of the alphabet before the letters that appear at the end. Some researchers have suggested that this effect may be due to exposure. In other words, children may receive more exposure to letters that appear at the beginning of the alphabet. Some literacy programs, for example, use a "letter of the week" approach that follows the order of the alphabet. In addition, some informal learning contexts, such as games and television, follow this same approach (McBride-Chang, 1999; Smythe, Stennett, Hardy, & Wilson, 1971).

The Letter-Name Pronunciation Effect asserts that letters containing their pronunciation in their letter name (e.g., B, P) are learned earlier than letters that do not contain their name in their pronunciation (e.g. W, Y) (McBride-Chang, 1999; Treiman & Broderick, 1998; Treiman, Richmond-Welty, & Tincoff, 1997; Treiman, Tincoff, Rodriguez, Mouzaki, & Francis, 1998). In addition, some researchers (Treiman & Broderick, 1998) have found an advantage for letters whose names are expressed as consonant-vowel syllables (e.g., B, D) when compared to letters whose names are expressed as vowel-consonant syllables (e.g., F, L). Other researchers (McBride-Chang, 1999) have not found such an advantage.

The last theory, the Consonant-Order Hypothesis, argues that the order in which children acquire spoken phonemes affects the order in which they learn the graphemes that correspond to those phonemes. Specifically, earlier acquired consonant phonemes (e.g., *b*, *d*, *g*) will

correspond to earlier learned letters; whereas, later acquired phonemes (e.g. *s, l, r*) will correspond to later learned letters (Justice, Pence, Bowles, & Wiggins, 2006).

In the only study to empirically test the validity of these four hypotheses, Justice et al. (2006) evaluated 339 4-year-old children. Children were randomly shown all 26 alphabet letters on a sheet of paper and asked to name each letter. The results of a linear logistic test model (LLTM) showed that *B, X, O,* and *A* were identified by the greatest percentage of children (55%, 48%, 44%, and 44%, respectively); whereas, *V, U, N,* and *G* were identified by the least percentage of children (13%, 15%, 16%, and 17%, respectively). With regard to the four hypotheses, results from the LLTM supported the following:

- The first letter of children's names was 7.3 times (CI=5.2 – 10.2) more likely to be named than a letter not in children's first names. This finding supported the Own-Name Advantage theory.
- Letters that occur earlier in the alphabet were 1.02 times (CI=1.01 – 1.03) more likely to be named than letters that occur later. This finding provided some support for the Letter-Order Hypothesis.
- Letters containing their own name in their pronunciation were 1.8 times (CI=1.5 – 2.2) more likely to be named when compared to letters that do not have their name in their pronunciation. This finding provided some support for the Letter-Name Pronunciation Effect.
- Children were 1.09 (CI=1.04 – 1.15) times more likely to name the letter associated with earlier-developing phonemes than the letters associated with later-developing phonemes. This finding provided some support for the Consonant-Order Hypothesis.

These findings appear to provide some support for each theory, with the strongest support noted for the Own-Name Advantage Theory. Both intrinsic and extrinsic factors appear to influence children's learning of individual letters, including whether the letter represents the child's first initial, the child's familiarity with the letters through environmental exposure, the pronunciation of the letters, and their position in the alphabet. Of particular importance is confirmation of previous research showing that the letters in children's own names are privileged over other letters. In conclusion, it appears that the order of uppercase letter learning is highly variable among children and that one of the most influential factors in letter learning order is the first letter of the child's first name.

### Theoretical Perspectives of Lowercase Letter Acquisition

Four theories also exist to explain the order in which children acquire lowercase letters, one of which is the same for the acquisition of uppercase letters, the Own-Name Advantage. The Own Name Advantage asserts that children are more likely to know the lowercase letter that corresponds to the first letter of their first name than other letters. Although substantial evidence exists for the Own-Name Advantage for uppercase letters, only one study has examined the validity of this theory for lowercase letters, and similar findings were reported (Treiman & Kessler, 2004).

The Uppercase Familiarity Theory contends that children gain knowledge of uppercase letters before knowledge of lowercase letters. Therefore, children are more likely to know

lowercase letters when they know the corresponding uppercase letters than when they do not (Worden & Boettcher, 1990).

The Frequency in Printed English Theory argues that children are more likely to know the lowercase letters that appear most frequently in printed English. Smythe et al. (1971) found a frequency effect for uppercase English letters; whereas, Treiman, Levin, and Kessler (2007) did not.

The Uppercase-Lowercase Similarity Theory suggests that children are more likely to know lowercase letters that are visually more similar to corresponding uppercase letters than lowercase letters that are more visually distinct (Treiman & Kessler, 2004). Treiman and Kessler (2004) reported that when the upper- and lowercase letters were visually similar, kindergarten children accurately identified significantly more lowercase letters ( $p < .001$ ) than when upper- and lowercase letters were not visually similar ( $p < .005$ ).

To compare support for these four hypotheses, Turnbull, Bowles, Skibbe, Justice, and Wiggins (2010) tested the letter knowledge of 461 preschool children. The children completed two separate tasks, naming uppercase letters and lowercase letters. All letters were presented randomly. Results revealed that the largest percentage of children knew the following uppercase letters: A (87%), O (86%), X (83%), S (83%) and B (83%). Three corresponding lowercase letters were also known by the largest percentage of children, o (84%), s (80%), and x (79%). Results from a multilevel logistic regression designed to test the four hypotheses revealed the following:

- Children who knew an uppercase letter were 16.09 times (CI=11.90, 21.76) more likely to know the corresponding lowercase letter than children who did not know the uppercase letter. This finding provided support for Uppercase Familiarity.

- When upper- and lowercase letters are more visually similar, children were 1.18 times (CI=1.04, 1.34) more likely to know the lowercase letter than when the upper- and lowercase letters are more visually distinct. This finding provided some support for Uppercase-Lowercase Similarity.
- The interaction of uppercase knowledge and uppercase-lowercase similarity showed that children were more likely to know a lowercase letter when they know the corresponding uppercase letter and when the upper- and lowercase letters are more visually similar. When children knew an uppercase letter, their knowledge of the corresponding lowercase letter was increased by a factor of 2.39 (CI=2.06, 2.76) when the two letters were more visually similar. This finding provided some support for both Uppercase-Lowercase Similarity and Uppercase Familiarity.
- There was no evidence that children were more likely to know a letter if it was the first letter of their name. This finding does not provide any support for the Own Name Advantage.
- When children knew the initial uppercase letter of their first name, the likelihood that they also knew the corresponding lowercase letter was increased by a factor of 2.82 (CI=1.01, 7.95). This finding provided some support for Uppercase Familiarity.
- Children were more likely to know the more frequently occurring letters in printed English than the less frequently occurring letters. This finding did not appear to be dependent on children's knowledge of the corresponding uppercase letter (odds ratio=.95, CI=.93, .96) and provided minimal support for frequency of occurrence.

While the Own Name Advantage appears to be the major single influence in the acquisition of uppercase letters, this theory did not hold for the acquisition of lowercase letters.



On the other hand, there appeared to be an interaction between the Own-Name Advantage and Uppercase Familiarity theories in learning lowercase letters, which provided an explanation for order of acquisition that had not been suggested previously. With regard to lowercase letters, the Own Name Advantage only facilitates acquisition when children know the corresponding uppercase letter of their first names. When children do not know the corresponding uppercase letter, there is no evidence of the Own Name Advantage.

In conclusion, it appears that uppercase letter knowledge is the primary mechanism children use to drive acquisition of lowercase letters. Children may be influenced by other factors such as the first letter of their own first names, the frequency of the letter in printed English, and the visual characteristics of the letter, but these are not the primary mechanisms on which children rely to acquire lowercase letter knowledge.

These findings suggest that the mechanisms underlying the acquisition of lowercase letter knowledge are different from those underlying the acquisition of uppercase letter knowledge. The acquisition of uppercase letter knowledge seems to be determined primarily by whether letters serve as the first letter of children's first names; however, other factors such as children's familiarity with individual letters through environmental exposure, how letters are pronounced, and where letters are positioned in the alphabet also play influential roles. In contrast, the acquisition of lowercase letter knowledge seems to be largely determined by whether children know the corresponding uppercase letter. Finally, the Own-Name Advantage only appears to hold for uppercase letters.

## Development of Alphabet Knowledge in Typically Developing Children

Research on the developmental changes in alphabet knowledge shows that children acquire letter knowledge in the absence of formal instruction. McCormick and Mason (1981) examined letter and word knowledge of 59 kindergarten children in April of their kindergarten year and again in September of their first grade year to determine changes in knowledge over the summer. When comparing the spring and fall results, children showed gains in both uppercase letter naming (93% versus 97% correct) and lowercase letter naming (87% versus 92% correct). Research also demonstrates a developmental sequence in the acquisition of letter knowledge. Children typically acquire uppercase letter knowledge earlier than lowercase knowledge (Mason, 1980; Smythe, et al., 1971; Worden & Boettcher, 1990). In addition, they use letter names to link speech to print (Treiman & Rodriguez, 1999; Treiman, Tincoff, & Richmond-Welty, 1996). Thus, it appears that learning letter sound correspondences is dependent upon knowing letter names (McBride-Chang, 1999; Treiman, et al., 1998).

## Development of Naming and Writing Abilities

The ability to name and write uppercase letters tends to outpace those same abilities with regard to lowercase letters early on, but the differences disappear by 6 to 7 years of age (Mason, 1980; Smythe et al., 1971; Treiman & Kessler, 2004; Worden & Boettcher, 1990). In an early study of emergent literacy, Mason (1980) followed 38 preschool children for one school year. Children's literacy skills were assessed throughout the year using a variety of assessments as

well as two parent questionnaires distributed in September and May. Results from a chi-square analysis of parent's responses to the two questionnaires revealed an almost 50% increase in children's ability to print in both upper- and lowercase letters over the course of the school year. On the fall questionnaire, 23 parents reported that their children printed only in uppercase letters, and 11 parents reported that their children printed in lowercase letters or both cases. In contrast, only 8 parents reported that their children printed only in uppercase letters and 30 reported that their children printed in lowercase or both cases (chi square=47.4,  $p<.01$ ) on the spring questionnaire.

Several researchers (Smythe et al., 1971; Treiman & Kessler, 2004; Worden & Boettcher, 1990) directly tested the alphabet knowledge of children ranging in age from 3- to 7-years of age. Results from all studies noted that younger children were able to name significantly more uppercase letters than lowercase letters. For example, Worden and Boettcher (1990) reported that 7.8% of the 3-year-old children were able name 21 to 26 uppercase letters, but no 3-year-olds were able to name more than 20 lowercase letters. These differences in naming performance disappeared by 6- to 7-years of age.

Worden and Boettcher (1990) also examined changes in children's ability to write upper- and lowercase letters. Results revealed that older children were able to print significantly more letters than younger children; whereas, younger children were able to print significantly more uppercase letters than lowercase ones. Specifically, 25.5% of the 4-year-old children were able to print between 6 and 20 uppercase letters, but only 14.3% of those children could print the same number of lowercase letters. The largest gains in printing ability took place from 3- to 6-years of age.

In conclusion, children acquire uppercase letter knowledge before lowercase knowledge. In particular, younger children were able to name and write significantly more uppercase than lowercase letters; however, the uppercase advantage disappeared by age 6 to 7.

### Linking Speech to Print

Treiman et al. (1996) conducted two different experiments to determine whether preschool children use knowledge of letter names to relate speech to print. In the first experiment, 16 preschool children were presented with words and asked to name the initial letter (beginning condition) and the final letter (ending condition). After the ending condition, the children were shown letters and asked to both name the letter and its sound. Results showed significant main effects for word type ( $p=.014$ ) and position ( $p=.004$ ) but no interaction between the two. Children performed 13% better on words that contained the letter-name (e.g. *jail*) than on control words (e.g. *June*) and were 20% better at naming the initial letter of a word as opposed to the final letter.

In the second experiment, 26 preschool children were tested on 48 words divided into eight categories. The categories included monosyllabic and bisyllabic groups, each of which contained correct letter-name and false letter-name groups as well as control groups. For example, in a monosyllabic word, a correct letter-name word would be *bead* and a correct control letter-name word would be *bait*; whereas, a false letter-name word would be *meal* and a false control letter-name word would be *moan*. Results from an ANOVA revealed a significant main effect for word type ( $p=.010$ ) but did not find a significant difference for number of

syllables or evidence of an interaction. These findings provide evidence that children were better at naming the initial letter of a word when the word contained the letter name (e.g. *bead*, *beaver* versus *bait*, *bonus*). The results of these two experiments demonstrate that children first begin relating speech to print by finding links between the printed letters in words and the names of the letters in the corresponding spoken words.

In an extension of Treiman et al. (1996), Treiman and Rodriguez (1999) taught 36 preschool and 38 kindergarten children how to pronounce three different types of made-up spellings: words that provided a letter-name and a letter-sound cue (BT pronounced “beet”); words that only provided a letter-sound cue (BT pronounced “bait”); and, words where the visual shape was more distinctive, but the pronunciations were arbitrary (bT for “ham”). Results from an ANOVA revealed that novice readers (children able to read at least one of the 22 tested words) were able to read significantly more words in the name condition than in the sound condition ( $p < .001$ ) and significantly more words in the sound condition than in the visual condition ( $p < .001$ ). Prereaders, children unable to read any of the 22 tested words, demonstrated a different pattern of results. This group showed significantly better performance in the name condition than in the sound and visual conditions ( $p = .01$ ), which were not different from each other. These results suggest that prereaders were only able to benefit from letter-name cues but not letter-sound cues; whereas, novice readers were able to use both letter-name and letter-sound cues. Thus, the results of these studies support the conclusion that young children who have some knowledge of letter names can use their knowledge of letter names to connect speech to the printed word.

### Letter-Sound Correspondences Dependent on Letter Names

Treiman et al. (1998) found that children knew more individual letter names than their corresponding sounds. In this study, the researchers reported on two studies that included data from three separate data sets. The studies included a total of 660 children between the ages of 3 ½ and 7 ½. Children were shown letters and asked to name them and shown letters and asked to provide an appropriate sound for the letter. The researchers were interested in whether children knew more letter names when the phoneme that the letter commonly represents occurs in the name of the letter and whether the position of the phoneme (beginning, middle, or end of the letter's name) influences children's identification of the letter's sound. For example, the sound for the letters *b, c, d, g, j, k, p, t, v,* and *z* occurs at the beginning of the letter's name, while the sound for the letters *f, l, m, n, r, s* and *x* occurs at the end of the letter's name. For the letters *h, q, w,* and *y*, the letter's sound does not occur in the letter's name. Results from ANOVAs for all three data sets revealed similar findings. Children produced significantly more letter-sounds when the sound was at the beginning of the letter name than when it was at the end. They also significantly produced more letter-sounds when the sound was at the end of the letter name than when it was not in the name at all.

In the second study, Treiman et al. (1998) tested the hypothesis that letter-name knowledge and phonological skills make some letter-sound correspondences easier to learn than others. In order to test this hypothesis, ten letters were chosen based on whether the sound was an obstruent (e.g., stop, fricative or affricate) or sonorant (e.g., nasal, liquid or glide) and where the sound occurred in the letter's name. The ten letters selected were *d, v, f, s, l, m, g, h, w,* and *y*. Nine children who were familiar with the names of all ten letters, but knew fewer than three

of the ten letter-sound correspondences, were trained on the letter-sound correspondences over three training sessions. Results from ANOVAs demonstrated similar results to the first study. Children performed significantly better when the sound of the letter was in the letter's name but not when the sound of the letter was not in the letter's name ( $p < .006$ ). When examining whether the children demonstrated improved performance for some kinds of letters, but not others, results revealed that there was significantly more improvement when the sound of the letter was at the beginning of the letter's name than when the sound was at the end. ( $p = .04$ ). These results support the claim that children use letter names to learn letter-sound correspondences, and it is easier to learn letter-sound correspondence when the sound occurs in the beginning of the letter's name.

### Development of Alphabet Knowledge in Children with Language Impairment

Studies examining alphabet knowledge in preschool children with LI have reported that children with LI perform significantly worse on tasks of both identifying and naming letters when compared to their same-aged peers. Boudreau and Hedberg (1999) examined the phonological awareness skills, print convention knowledge, alphabet knowledge, and narrative skills of thirty-six children. Children ranged in age from 56 to 70 months and were divided into two groups: eighteen children in the language impaired group and eighteen children in the control group matched for age, gender, and socioeconomic status. Children were shown the 26 alphabet letters and asked to name them. Results revealed that children with LI scored

significantly lower than children in the control group ( $p=.016$ ). On average, children with LI could name 10.94 letters; whereas their typically developing peers could name 19.22.

Vandewalle et al. (2010) examined skills in phonological awareness, verbal short term memory, rapid automatized naming, and letter knowledge for 18 children with LI who ranged in age from 57 to 70 months and 18 typically developing children matched for age. Letter knowledge was measured using two different tasks. In the expressive task, children were shown the 16 most frequently used letters in Dutch books for children and were asked to both name the letter and give the letter- sound. For the receptive task, the examiner named the same 16 letters, and children had to point to the corresponding letter. All children were tested five times over the course of two years. At the end of kindergarten, mixed model analysis revealed that children with language impairment scored significantly lower than their typically developing peers on both the letter identification ( $p<.03$ ) and letter naming ( $p<.02$ ) tasks. On average, children with language impairment were able to name 2.5 letters and identify 4.2 letters; whereas, children developing typically were able to name 7.4 letters and identify 8.1 letters.

### Relationships among Emergent Writing, Phonological Awareness, and Letter Knowledge

Research clearly demonstrates that emergent writing, phonological awareness, and letter knowledge make significant contributions to later literacy outcomes (NELP, 2008). Further, these skills develop concurrently and interrelatedly (Teale & Sulzby, 1986; Tracey & Morrow, 2006), leading many researchers to examine the relationships among the components (Blaklock,



2004; Bloodgood, 1999; Burgess & Lonigan, 1998; Morris, Bloodgood, Lomax, & Perney, 2003; Welsch, et al., 2003). Results from these studies suggest that all three components share significant bidirectional relationships, whereby gains in one component can facilitate gains in another. In the sections that follow, the relationships among emergent writing, phonological awareness, and alphabet knowledge will be explicated.

### Relationship of Letter Knowledge to Phonological Awareness

Alphabet knowledge forms the foundation for the development of word recognition skills. Morris et al. (2003) followed 102 children during their first two years of school to examine early reading development. Children were tested in September, February, and May of their kindergarten year and in October and May of their first grade year on tasks of alphabet knowledge, phonemic awareness, word recognition, and reading comprehension. Results from structural equation modeling found the best fit for the data supported the following developmental model (adapted from pg. 321):

Table 3: Developmental Model of Early Reading

Kindergarten	1. alphabet knowledge 2. beginning consonant awareness 3. concept of word in text 4. spelling with beginning and ending consonants 5. phoneme segmentation
First grade	6. word recognition 7. contextual reading ability

These results provide evidence that alphabet knowledge underlies other emergent literacy skills and serves as a precondition for the development of word recognition skills. Further, children use letter knowledge as a vehicle to link speech to print, since learning letter-sound correspondences is dependent upon knowledge of letter names (McBride-Chang, 1999; Treiman & Rodriguez, 1999; Treiman et al., 1996; Treiman et al., 1998).

In a longitudinal study, Blaiklock (2004) enrolled 36 5-year-old children in a 2-year long study. Of the 36 children enrolled at the beginning of the study, 29 children completed the first year of the study and 27 completed both years of the study. Children were tested six times during the first year of the study and three times during the second year with the following assessments: letter-name task, letter-sound task, digit span task, identifying rhyming words task, and a phoneme deletion task. Results from correlational analyses and regression analysis found significant positive relationships between phonological awareness and the development of reading skills, which were mediated by the role of letter knowledge. Specifically, significant correlations were found between rhyme awareness and reading at testing times two, three, and four (.37, .35, and .57, respectively,  $ps < .05$ ). When controlling for letter knowledge, the correlation decreased to .22, .24, and .40, respectively. Results from stepwise regression analysis showed that letter name knowledge was the largest predictor of reading ability at the end of the first year and letter sound knowledge was the largest predictor of reading ability at the end of the second year. These findings support the conclusion that letter knowledge mediates phonological awareness as children develop reading skills

## Relationship of Phonological Awareness to Letter Knowledge

In the first study to examine the influence of phonological awareness on the acquisition of letter-name and letter-sound knowledge in preschool children, Burgess and Lonigan (1998) assessed 115 4- and 5-year-old children at two different times, one year apart. At the initial test session, children completed two standardized oral language tests, four phonological awareness tasks, and two letter-knowledge tasks. One year later, 97 remaining children completed the same four phonological awareness tasks and the two letter-knowledge tasks. Multiple regression analysis was used to test for reciprocal relations between phonological awareness and letter knowledge. Results from separate sets of analyses found letter-name knowledge at Time 1 contributed a significant amount of independent variance to all higher level phonological awareness measures at Time 2 ( $p < .05$ ). This result is consistent with other findings and suggests that letter knowledge plays an important role in the development of phonological awareness development (Blaklock, 2004). Second, results revealed that letter-sound knowledge at Time 1 contributed a significant amount of independent variance to phoneme elision at Time 2 ( $p < .05$ ). Together, these two findings suggest that knowledge of letter-names was more influential in the later development of phonological awareness and letter-sound knowledge than was letter-sound knowledge. Letter-name knowledge contributed a significant amount of independent variance to all phonological awareness measures; whereas, letter-sound knowledge only contributed a significant amount of independent variance to elision. Finally, results revealed that phonological awareness at Time 1 contributed a significant amount of independent variance to both letter-name and letter-sound knowledge at Time 2 ( $p < .05$ ). These results demonstrate a bidirectional relationship between alphabet knowledge and phonological

awareness. Higher levels of initial letter knowledge led to higher levels of phonological awareness one year later and higher initial levels of phonological awareness led to higher levels of subsequent alphabet knowledge.

In a similar study, Foy and Mann (2006) assessed 66 preschool children, ages 4 to 6 years, twice during their preschool year to examine whether acquisition of specific letter knowledge was correlated with phonological awareness. Children were assessed in the spring and summer of the school year with the following assessments: rhyme awareness (i.e., rhyme recognition and rhyme production), phoneme awareness (i.e., phoneme judgment, deletion, and substitution), and letter-name and letter-sound knowledge. Results from cross-lagged correlation procedures at Time 1 and Time 2 found significant bidirectional correlations. Phoneme awareness and rhyme awareness predicted letter-sound knowledge ( $ps < .05$ ) and letter-sound awareness helped to facilitate deeper levels of phonological awareness such as phoneme manipulation ( $ps < .05$ ). In this study as in that of Burgess and Lonigan (1998), letter knowledge and phonological awareness appeared to share a bidirectional relationship, whereby gains in letter knowledge facilitated gains in phonological awareness and vice versa.

#### Relationship of Emergent Writing to Alphabet Knowledge and Phonological Awareness

Bloodgood (1999) assessed 56 preschool children who ranged in age from 3- to 5-years. Children were assessed twice during the school year on a variety of measures, including name-writing ability, color knowledge, alphabet knowledge, spelling, reading ability, phonological

awareness, and writing. Results showed that more advanced name writing ability was significantly correlated with better ability to write the letters of the alphabet and to recognize words.

Welsch, Sullivan, and Justice (2003) expanded Bloodgood's (1999) study by including a larger sample of children. In their study, 3,546 4-year-old children completed the *Phonological Awareness Literacy Screening for Preschool* (PALS-PreK; Invernizzi, Sullivan, & Meier, 2001) which included measures of name writing ability, rhyme awareness, beginning sound awareness, alphabet knowledge, concept of word, and print knowledge. Using Ferreiro & Teberosky's (1982) framework, children were placed into one of four groups based on the developmental level of their name writing representations: Group 1, unconventional, non-symbolic; Group 2, random symbols and letters; Group 3, nearly correctly written name; and, Group 4, correctly written name. ANCOVA analysis controlling for age revealed that each group differed significantly on all five measures ( $p < .001$ ), and post hoc pairwise comparisons revealed that all name writing groups differed for each of the emergent literacy measures ( $p < .001$ ). Results of linear regression analysis showed that alphabet knowledge and print concepts accounted for 34% of the variance in name-writing ability ( $p < .001$ ). Thus, these results demonstrate that children in Group 4, who had more advanced writing skills, were also the children who had the highest scores on the other emergent literacy measures of rhyme awareness, beginning sound awareness, alphabet knowledge, concept of word, and print knowledge. Additionally, results revealed that alphabet knowledge contributed significantly ( $R^2 = .258, p < .001$ ) to the variance in children's name-writing ability. Thus, these results corroborate Bloodgood's (1999) finding that more advanced name writing skills are associated with higher levels of other emergent literacy skills

and extend that finding by demonstrating that alphabet knowledge contributes significantly to name writing ability.

Blair and Savage (2006) examined the relationships among phonological awareness, letter-sound knowledge, and name writing in 38 children who ranged in age from 47 to 69 months. Children were assessed over four sessions on a variety of language and emergent literacy tasks, including receptive vocabulary, word recognition, letter-sound knowledge, name writing ability, environmental print recognition, phonological awareness, and environmental print. Results revealed that letter-sound knowledge accounted for a significant amount of variance in name writing ability ( $R^2=.16, p<.01$ ), and phonological awareness accounted for a significant amount of the variance ( $R^2=.16$  and  $.17$ , respectively,  $p<.01$ .) in name writing ability, after controlling for letter-sound knowledge. Unlike previous research that did not find significant relationships between name-writing ability and phonological awareness, these findings suggest that phonological awareness skills are related to name writing ability. Unfortunately, this research study did not measure letter knowledge; therefore, it is difficult to reconcile these findings with the previous research conducted by Bloodgood (1999) and Welsch et al (2003). It may be the case, then, that alphabet knowledge and not phonological awareness, makes unique contributions to name writing ability.

In an extension of the existing literature, Diamond, Gerde, and Powell (2008) examined both the predictive and the concurrent associations between children's name writing abilities and their understanding of letters and initial sounds. A total of 236 children, ages 39 to 67 months, were assessed three times during the school year using the following measures: name-writing, alphabet knowledge, initial sound identification, and print concepts. Linear growth-curve models (both random and fixed effects) examining associations between name writing and changes in

letter knowledge and print concepts revealed significant main effects for name writing ( $p < .01$ ). Specifically, for every one point increase in the name writing score, there was a corresponding increase of an additional letter named (.99 increase in letter knowledge,  $p < .01$ ). Thus, growth in writing was significantly associated with growth in letter knowledge and print concepts. To determine the direction of effects between letter knowledge and writing ability, cross-lagged correlational analysis was conducted. For children who included at least one letter when writing their names, writing ability in the fall was a strong predictor of growth in letter knowledge from fall to winter ( $\beta = .38$ ); however, letter knowledge was not as strong a predictor of writing growth from fall to winter ( $\beta = .22$ ). Finally, writing and letter knowledge were equivalent predictors for spring ( $\beta = .23$  and  $.22$ , respectively). For children who did not write letters, none of the relationships among these variables was significant. These results suggest that significant, bidirectional relationships between letter knowledge and name writing ability only exist for children who write letters. For children who are not yet writing letters, there were no significant relationships between name writing ability and letter knowledge.

Taken together, the research to date clearly demonstrates that letter knowledge and name writing ability share significant, bidirectional relationships. The findings of Diamond et al. (2008) suggest that these relationships might only exist once children have begun to write letters; however, this finding is not supported by Welsch et al. (2003), who found that alphabet knowledge contributed the most amount of variance in name writing ability for all children in their sample, including children who were not yet writing letters.

Finally, the relationship of phonological awareness and name writing ability is not well understood. Blair and Savage (2006) reported that phonological awareness was a strong predictor of name writing ability, and Diamond et al. (2008) reported that name writing ability

significantly and positively predicted initial sound knowledge. In contrast, Bloodgood (1999) did not find significant correlations between phonological awareness and name writing ability, and Welsch et al. (2003) found that phonological awareness did not contribute a significant amount of unique variance after controlling for alphabet knowledge. At least two different reasons may account for the different findings. The first involves differences in measurement. Blair and Savage used a 4-point scale; whereas, Welsch, et al. used a 7-point scale, and Diamond et al. used a 9-point scale. The second reason involves task differences. The kinds of tasks included in each study varied in both the number and complexity of tasks. Blair and Savage used several phonological awareness tasks, including identifying words with the same initial or final sounds, identifying rhyming words, producing words with the same initial or final sounds, and producing rhyming words. In contrast, Bloodgood (1999) only included three phonological awareness tasks (i.e., syllable tapping, identifying initial consonants, and identifying non-rhyming words), and Welsch et al. only included two measures of phonological awareness (i.e., matching initial sounds and identifying rhyming words). Thus, the research to date demonstrates that name writing ability is related to both alphabet knowledge and phonological awareness; however, the exact nature and directions of these relationships are not well understood.

### Conclusions

Emergent literacy theory conceptualizes literacy as a continuum from pre-reading to reading without a clear boundary between the two. Like speaking and listening, emergent



literacy skills begin development at birth. All four language modalities – listening, speaking, reading and writing – demonstrate a high degree of interrelatedness as they develop together throughout the early years. Emergent writing, AK, and PA are three major components of emergent literacy which have emerged as important, reliable, and stable predictors of later conventional literacy outcomes (NELP, 2008). In addition, these three components share significant bidirectional relationships; whereby, gains in one component can facilitate gains in another (Blaiklock, 2004; Burgess & Anthony, 1998; Foy & Mann, 2006). To date, the relationship among emergent writing, PA, and AK is not well understood (Blair & Savage, 2006; Bloodgood, 1999; Diamond et al., 2008; Welsch et al., 2003). Given the importance of these emergent literacy components to later literacy achievements, it would seem that understanding the nature and direction of relationships among the three is critical.

Many children with LI experience significant difficulty in developing emergent literacy skills. In studies comparing the emergent literacy skills of children with LI to those of their typically developing peers, children with LI have consistently demonstrated depressed emergent literacy skills in the areas of phonological awareness, print concepts, alphabet knowledge, and emergent writing (Boudreau & Hedberg, 1999; Cabell et al., 2009; Gillam & Johnston, 1985; Justice et al., 2006; Kahmi et al., 1985; Magnusson & Naucler, 1990; Nathan et al., 2004). Unfortunately, research examining the emergent writing skills in preschool children with language impairment is limited only to name writing (Cabell et al., 2009). As discussed earlier, children may use more advanced writing features when the task is easier (e.g., name writing) and less advanced features when the task is more difficult (e.g., describing a picture or writing a story). Therefore, name writing ability may not be the best indicator of children's overall

emergent writing abilities. Thus, use of a wider array of tasks may help to better describe the emergent writing skills in children with LI (Puranik & Lonigan, 2009).

## CHAPTER 3: METHODS

This chapter reintroduces the purpose of the study and the research questions, followed by a description of the participants and the research instrumentation. The chapter concludes with a description of the research design and the data analysis procedures.

### Purpose

The purposes of this research are two-fold. First, this study will compare the emergent writing skills of preschool children with language impairment (LI) to their typically developing peers using a range of writing tasks and a detailed, discrete point scoring rubric for each task (Puranik & Lonigan, 2009). Second, the study will explore the relationships among emergent writing skills and other emergent literacy components, specifically, alphabet knowledge (AK) and phonological awareness (PA) as well as the relationship between emergent writing and oral language.

## Research Questions

The specific research questions addressed in this study include:

1. Do 4-year-old preschool children with language impairment demonstrate significant differences in their emergent writing skills when compared to their age-matched, language typical peers?
2. Do 4-year-old preschool children with language impairment demonstrate the same developmental sequence in their emergent writing skills as their age-matched language typical peers?
3. Do language typical 4-year-old preschool children demonstrate significant differences in their emergent writing skills when compared to language typical 5-year-old preschool children?
4. What are the relationships among emergent writing, alphabet knowledge, phonological awareness and oral language for both children with typical language development as well as children with language impairment?

## Participants

This study included three groups of participants: 11 4-year-old children diagnosed with LI; 20 language typical 4-year-old children, 11 of whom were age-matched to the children with LI; and, 20 language typical 5-year-old children.

The decision to match the LI children to typically developing children using age alone was based on a review of the research. Research examining the differences between typically developing children and children with LI has traditionally used one of three kinds of comparisons: 1) a comparison of children with LI to both their age-matched peers and younger, language-matched controls; 2) a comparison of children with LI to age-matched controls; or, 3) a comparison of children with LI to children matched for mental age (Leonard, 1998). According to Leonard (1998), the choice of an appropriate comparison group is dependent on the kind of information sought. When typically developing children might approach mastery on the skill being measured, then the use of younger, typically developing children who are matched to the children with LI on some measure of language ability might be appropriate. In the case of emergent writing, however, typically developing children would not be expected to have achieved mastery on any of the writing skills being measured. Of the 201 typically developing 4-year-olds in the Puranik and Lonigan (2009) study, for example, only 45.8% were able to correctly write their first name. Thus, the inclusion of a comparison group of younger, typically developing children who are matched to the children with LI on some measure of language ability does not seem warranted.

Plante, Swisher, Kiernan, and Restrepo (1993) provide three additional arguments relative to why language-matched control groups may not be appropriate. Of particular relevance to this study is the argument that matching participants on language ability often requires the control group to be younger in age, which introduces an extraneous age effect. According to Plante, et al., attributing results to language level involves an assumption that no developmental (e.g., cognitive, social, physical, experiential) differences exist in the way children with LI and their younger, language-matched controls complete the research tasks. In the case of emergent

writing, it does not seem reasonable to assume that there would be no developmental differences between children with LI and their younger, typically developing peers. For example, several research studies have reported that younger, typically developing children were unable to complete all emergent literacy research tasks (Fey & Leonard, 1984; Puranik & Lonigan, 2009; Terrell & Schwartz, 1988). This is particularly true in the case of emergent writing. Puranik and Lonigan (2009) reported that many of the typically-developing 3-year-old children in their study were unable to complete the complex writing tasks, and their scores were reflective of floor effects. Thus, the use of younger, language-matched participants appears not only unwarranted but also inappropriate for the current study.

### Participants with Language-Impairment

Consistent with criteria reported in the literature pertaining to specific language impairment (e.g., (Leonard, 1998; Tomblin, et al., 1997; Yarosz & Barnett, 2001), children in this study were classified as LI based on the following:

- Demonstrated unremarkable developmental history in the areas of sensory, neurological, and motor performance as reported by the mother or other caregiver on a questionnaire;
- Passed a bilateral hearing screening (25dB at 500, 1000, 2000, and 4000 Hz);
- Achieved a standard score of 85 or higher on a nonverbal cognitive screening instrument (i.e., matrices subtest of the *Kaufman Brief Intelligence Test, 2<sup>nd</sup> Ed.*, (K-BIT-2; Kaufman & Kaufman, 2004);

- Achieved a standard score between one and two standard deviations below the mean (i.e., scores between 70 and 84) on the Language Index of the *Assessment of Literacy and Language* (ALL; Lombardino, Lieberman, & Brown, 2005);
- Spoke English as the primary language in the home; and,
- Had a mother with a high school education, or equivalent, or higher.

### Language-Typical Participants

Children meeting the following criteria were classified as typically developing:

- Demonstrated unremarkable developmental history in the areas of sensory, neurological, motor, speech, and language performance as reported by the mother or other caregiver on a questionnaire;
- Passed a bilateral hearing screening (25dB at 500, 1000, 2000, and 4000 Hz);
- Achieved a standard score of 85 or higher on the matrices subtest of the K-BIT-2;
- Achieved a standard score within one standard deviation of the mean (i.e., scores between 85 and 115) on the Language Index of the ALL;
- Spoke English as the primary language in the home; and,
- Had a mother with a high school education, or equivalent, or higher.

Tables 4, 5, and 6 include the characteristics and assessment scores of each participant group.

Table 4: Participant Characteristics and Assessment Scores of LT 4-Year-Old Children

Participant	Age <sup>a</sup>	Gender	K-BIT-2 <sup>b</sup>	ALL Language <sup>c</sup>
101	51	F	110	100
105	54	M	115	97
106	53	M	99	88
107	48	F	107	94
112	48	M	101	100
113	49	F	99	96
115	58	F	90	91
118	57	M	85	94
120	52	F	112	109
121	59	M	98	108
125	59	F	113	100
131	56	M	96	89
132	52	F	115	94
136	56	F	103	106
138	55	F	109	115
139	53	F	103	112
142	57	F	109	111
146	59	F	110	108
149	59	M	98	89
153	50	M	105	96

<sup>a</sup>Age = age in months; <sup>b</sup>K-BIT-2 = Kaufmann Brief Intelligence Test-2<sup>nd</sup> Edition, Matrices Subtest, Standard Score; <sup>c</sup>ALL Language = Assessment of Literacy and Language, Language Index Score



Table 5: Participant Characteristics and Assessment Scores of 4-Year-Old Children with LI

Participant	Age <sup>a</sup>	Gender	K-BIT-2 <sup>b</sup>	ALL Language <sup>c</sup>
108	49	M	112	82
109	50	M	100	76
110	49	M	101	77
111	53	F	99	79
124	58	F	98	73
140	51	M	97	70
148	49	M	99	71
149	48	M	90	76
147	57	F	121	71
152	48	M	95	83
151	59	F	86	82

<sup>a</sup>Age = age in months; <sup>b</sup>K-BIT-2 = Kaufmann Brief Intelligence Test-2<sup>nd</sup> Edition, Matrices Subtest, Standard Score; <sup>c</sup>ALL Language = Assessment of Literacy and Language, Language Index Score

Table 6: Participant Characteristics and Assessment Scores of LT 5-Year-Old Children

Participant	Age <sup>a</sup>	Gender	K-BIT-2 <sup>b</sup>	ALL Language <sup>c</sup>
102	62	F	97	115
103	62	M	104	115
104	62	F	116	109
114	64	M	103	97
116	60	F	100	100
117	64	F	103	105
123	65	F	114	91
126	61	F	94	100
127	60	F	110	114
128	62	M	104	97
129	61	M	107	112
130	63	F	107	99
133	68	F	96	86
134	68	F	96	88
135	63	M	100	94
137	65	F	100	100
141	63	F	100	109
143	62	F	110	85
145	68	M	96	96
148	60	M	110	102
150	61	M	100	103

<sup>a</sup>Age = age in months; <sup>b</sup>K-BIT-2 = Kaufmann Brief Intelligence Test-2<sup>nd</sup> Edition, Matrices Subtest, Standard Score; <sup>c</sup>ALL Language = Assessment of Literacy and Language, Language Index Score

#### Instrumentation Used to Determine Eligibility for Participation

Two instruments were used to identify participants for inclusion in this study: the *Assessment of Literacy and Language* (ALL; Lombardino, Lieberman, & Brown, 2005) and the *Kaufman Brief Intelligence Test – 2* (K-BIT-2; Kaufman & Kaufman, 2004). The Language Index of the ALL identified language performance of participants as typical or impaired. To be

considered language typical, participants needed to score between 90 and 110 on the Language Index and to be considered LI, between 70 and 84. The matrices subtest of the K-BIT-2 was used to screen participants relative to non-verbal intellectual functioning. To be included in the study, all participants needed to obtain a standard score of 85 or higher. These instruments are described below relative to their content and psychometric characteristics.

### Assessment of Literacy and Language (ALL)

The ALL is a nationally normed standardized test of literacy and language that is appropriate for preschool children. According to Lombardino, Lieberman, and Brown (2005), “The primary purpose of ALL is to diagnose children who exhibit language disorders and to identify children who are at risk for later reading disabilities....” (p. 1). Thus, the ALL is particularly well-suited for this research study, because it measures both language and literacy skills in preschool children. Further, the ALL includes measures of phonological awareness and letter knowledge, two of the components of emergent literacy that are the focus of this study.

The ALL reports two index scores for preschool children: the Language Index and Emergent Literacy Index. For purposes of identifying children as either typically developing or LI, the Language Index was used.

The Language Index is a composite of four ALL subtests: Basic Concepts, Receptive Vocabulary, Parallel Sentence Production, and Listening Comprehension. A description of each of these subtests follows. The Basic Concepts subtest “assesses a child’s knowledge of concepts

of size, number, location, shape, position, and comparison” (Lombardino et al., 2005, p. 14).

The Receptive Vocabulary subtest asks children to identify the referential meaning of increasingly difficult nouns and verbs. The Parallel Sentence Production subtest elicits specific grammatical morphemes and syntactic structures by asking children to describe a picture after listening to a prompt containing the specific target. The Listening Comprehension subtest measures children’s understanding of stories of increasing length and complexity by asking them to retell stories and then answer four questions about each story.

In 1984, McCauley and Swisher highlighted ten psychometric properties essential for standardized tests. These included: standardization sample, sample size, item analysis, mean and standard deviation of scores, concurrent validity, predictive validity, test-retest reliability, inter-examiner reliability, test administration procedures, and special qualifications. Table 7, adapted from McCauley and Swisher, describes the decision rules for determining whether specific tests meet the criteria for psychometric adequacy relative to each property.

Table 7: Psychometric Criteria and Decision Rules

<b>Criterion</b>	<b>Information Required to Determine Criterion Met</b>
1. <i>Standardization Sample</i>	Description of the number of sample participants in terms of (a) geographic residence; (b) socioeconomic status; and (c) information regarding the “normalcy” of the participants, including any participants who were excluded because they exhibited non-normal development or language.
2. <i>Sample Size</i>	At least 100 participants in the standardization sample for each age or grade.
3. <i>Systematic Item Analysis</i>	Evidence of quantitative methods to study and control item difficulty and/or item validity.
4. <i>Mean and Standard Deviation of Test Scores</i>	Means and standard deviations for the total raw scores of all relevant subgroups.
5. <i>Concurrent Validity</i>	Evidence that the categorization of children as impaired or normal agrees closely with other valid methods such as scores on other validated tests.
6. <i>Predictive Validity</i>	Evidence that it could be used to predict later performance of the same behavior.
7. <i>Test-Retest Reliability</i>	Empirical evidence of a test-retest reliability coefficient of 0.90 or higher.
8. <i>Inter-examiner Reliability</i>	Empirical evidence of an inter-examiner reliability coefficient of 0.90 or higher.
9. <i>Test Administration Procedures</i>	Describes administration procedures in sufficient detail to allow the user to duplicate the administration and scoring procedures used during standardization.
10. <i>Special Qualifications</i>	Describes any special qualifications required of the test administrator or scorer.

The ALL meets nine of the ten criteria, including standardization sample, sample size, item analysis, mean and standard deviation of scores, concurrent validity, test-retest reliability, inter-examiner reliability, test administration procedures, and special qualifications. It does not, however, report predictive validity. Of specific relevance to this study are the constructs of validity and reliability.

Broadly defined, validity is the extent to which the scores from a test measure what the test claims to measure (Salvia, Ysseldyke, & Bolt, 2010). According to the American Educational Research Association (AERA), the American Psychological Association (APA), and the National Council on Measurement in Education (NCME, 1999), “Validity is the most fundamental consideration in ...evaluating tests” (p. 9). Thus, any examination of a standardized assessment must begin with an analysis of validity. Salvia et al. (2010) define three categories of validity: content validity, criterion-related validity, and construct validity. Content validity refers to how well the test items actually represent the construct to be measured. The ALL demonstrates content validity. Both the content and subtest construction were designed to reflect the language and emergent literacy skills of preschool children based on the available research. The content was reviewed by the test authors, test developers, and an expert panel to ensure the appropriateness of the test items and to eliminate any potential bias (Lombardino, et al., 2005). Part of content validity includes an examination of the response process, since the way content is assessed “directly influences the results of assessment” (Salvia et al., 2010; p.66). The response processes of the subtests included in the ALL have strong theoretical and empirical evidence. In addition, response frequencies for multiple-choice items were examined during test development to determine the plausibility of incorrect answers and to determine whether modifications to the administration instructions and/or picture stimuli were needed (Lombardino, et al., 2005).

The second category of validity identified by Salvia et al. (2010) is criterion-related validity, which is how well the score from a criterion measure can be estimated from the score on the assessment being validated. Typically, criterion-related validity is expressed as a correlation between the assessment procedure (in this case, the ALL) and the criterion, and the resultant correlation coefficient is referred to as a *validity coefficient*. There are two kinds of criterion-related validity: concurrent validity and predictive validity. The difference between the two rests primarily on the time at which the two measures are administered. In the case of predictive validity, one measure is taken before another and is meant to predict performance on the later measure. In contrast, concurrent validity is evaluated when two measures are administered at approximately the same time and measure related constructs. Thus, the scores on the two measures are correlated with one another. Specific to the preschool population, the ALL reported concurrent validity with the *Clinical Evaluation of Language Fundamentals Preschool – Second Edition* (CELF-P2) and the *Pre-Reading Inventory of Phonological Awareness* (PIPA). On the Language Index, the ALL reported concurrent validity coefficients that ranged from .74 to .79 with the CELF-P2 and from .09 to .60 with the PIPA. On the Emergent Literacy Index, the ALL reported concurrent validity coefficients that ranged from .57 to .63 with the CELF-P2 and from .36 to .76 with the PIPA. The reason for the wide range of validity coefficients is due to the fact that the ALL includes both language and literacy tasks; whereas, the CELF-P2 includes only language tasks and the PIPA includes only literacy tasks. When the two tests are both testing similar skills (e.g., both testing language skills or both testing literacy skills), the validity coefficients are much higher than when the two tests are examining different skills. For example, the ALL and the CELF-P2 both measure expressive and receptive language. The validity coefficient for the parallel sentence production subtest of the ALL with the expressive

language composite score of the CELF-P2 is .73. In contrast, the validity coefficient for the letter knowledge subtest of the ALL with the expressive language composite score of the CELF-P2 is .25. Similarly, the validity coefficient for the letter knowledge subtest of the ALL with the letter-sound knowledge subtest of the PIPA is .80. Thus, the ALL shows high correlations with other measures of language and literacy when there is a high degree of overlap between the two tests.

In addition to issues of validity, scores from assessments must also be examined for their reliability. Reliability refers to “the absence of random error present during measurement” (Salvia et al., 2010; p.54). The reliability coefficient is a special use of a correlation coefficient that indicates “the proportion of variability in a set of test scores that reflects true differences among individuals” (p. 54). Salvia et al. (2010) recommend that the minimum standard should be .90 when using a test for an important decision, such as determining the presence or absence of a disorder. Test-retest reliability is also referred to as stability reliability and represents the correlation between the scores from two separate administrations of the same test over a short period of time. The ALL reported test-retest reliability of .93 for the Emergent Literacy Index and .92 for the Language Index (Lombardino, et al., 2005).

Internal consistency is another measure of reliability and is used to describe the homogeneity of the items in a subtest (Lombardino et al., 2005). There are two ways to calculate internal consistency, the split-half reliability estimate and the coefficient alpha. According to Salvia et al. (2010), coefficient alpha is the better method for determining internal consistency, because coefficient alpha computes the average split-half correlation using all possible divisions of a test into two parts. The ALL reported a coefficient alpha of .95 for the Emergent Literacy Index and .94 for the Language Index (Lombardino, et al., 2005).



Finally, when evaluating the clinical utility of a test, it is necessary to carefully examine the test's ability to accurately identify children who have the disorder of interest and to rule out the diagnosis in children who do not have the disorder. Two measurements of diagnostic accuracy are sensitivity and specificity. Sensitivity can be thought of as a "true positive" (i.e., a person with the disorder is identified as having the disorder). Conversely, specificity can be thought of as a "true negative" (i.e., a person who does not have the disorder is not identified as having the disorder). At one standard deviation below the mean, the ALL reported sensitivity of .98 and specificity of .89 (Lombardino, et al., 2005). This means that 98% of the individuals with language impairment were accurately identified as having language impairment and 89% of the individuals who did not have language impairment were accurately identified as having age-appropriate language skills. Plante and Vance (1994) argued that guidelines for accurate discrimination between children with normal language and children with language impairment should be relatively stringent and suggested that 90% should be considered good discriminate accuracy. Therefore, the ALL is considered to have good discriminate accuracy.

#### Kaufman Brief Intelligence Test – 2 (K-BIT-2)

The K-BIT-2 (Kaufman & Kaufman, 2004) is a nationally normed, standardized test of intelligence and is designed to obtain a quick estimate of verbal and nonverbal intelligence. The Matrices subtest is the measure of nonverbal intelligence on the K-BIT-2, and it evaluates the ability to solve new problems by assessing the perception of relationships and completion of

visual analogies. The matrices subtest contains 46 multiple-choice items that involve pictures of meaningful stimuli (e.g., people and objects) as well as abstract stimuli (e.g., designs and symbols). All of the items require an understanding of relationships among the stimuli. Examinees can either point to the correct response or say its letter. Because the K-BIT 2 is designed to be a brief, reliable measurement of both verbal and nonverbal abilities and to measure the “intelligence of various groups for research purposes” (Kaufman & Kaufman, 2004; p.3), it was ideally suited for obtaining a quick estimate of nonverbal abilities for this project.

The K-BIT-2 meets seven of the ten psychometric criteria proposed by McCauley and Swisher (1984). Because the examiner’s manual did not report any evidence of predictive validity or inter-examiner reliability, these criteria were considered “not met”. In addition, the criterion for test-retest reliability was not met. None of the correlations for the 4- to 12-year-old age group were above .90. Upon closer examination of reliability and validity, the K-BIT-2 demonstrates content validity by including techniques that have been well-established in the empirical literature through the use of confirmatory and exploratory factor analyses. Concurrent validity was established by analysis with performance on the *Wechsler Intelligence Scale for Children – Revised* (WISC-R), *Wechsler Adult Intelligence Scale – Revised* (WAIS-R), *Kaufman Brief Intelligence Test* (K-BIT), and the *Kaufman Assessment Battery for Children* (K-ABC). Specific to the preschool population, the K-BIT-2 reported a concurrent validity coefficient of .47 on the matrices subtest with the matrices subtest of the K-BIT. With respect to reliability, the K-BIT 2 reported split-half reliability of .78 for both 4- and 5-year-old children and test-retest reliability of .76 for the 4- to 12-year-old age group (Kaufman & Kaufman, 2004).

### Instrumentation Used to Address Research Questions

Two protocols were used to address the research questions associated with this study: a Writing Sample Protocol (Puranik & Lonigan, 2004) and the *Assessment of Literacy and Language* (ALL; Lombardino, et al., 2005). The Writing Sample Protocol evaluated participant's performance on emergent writing, while the Language Index and Emergent Literacy Index of the ALL evaluated performance on measures of oral language, phonological awareness, and alphabet knowledge. The psychometric characteristics of the ALL and the subtests included in the Language Index were described in a previous section of this chapter. The Writing Sample Protocol and the All subtests included in the Emergent Literacy Index are described in this section.

#### Writing Samples

The emergent writing skills of participants were measured using a protocol and scoring procedure developed by Puranik and Lonigan (2009). The complete results of their study are reported in Chapter 2 of this manuscript. Development of the writing protocol and scoring rubric was the first attempt in the research literature to include both a range of writing tasks as well as a discrete point scoring procedure to quantify children's emergent writing skills. Table 8, adapted from Puranik and Lonigan, describes each writing task as well as the scoring guidelines for that task

Table 8: Writing Tasks and Scoring Rubrics

Writing task	Task description	Scoring rubric
Write letters	Write letters: B, D, S, T, O, A, H, K, M, C	Score of 0, 1, or 2. Maximum Score = 2 0 = Incorrect letter or unrecognizable 1 = Poorly formed letter or reversals 2 = Correctly written letter
Write name	Children write their names	Score of 1 or 0 for presence or absence of each feature Maximum Score = 9 1. Linearity—writing units are organized in straight lines 2. Segmentation—writing contains distinguishable/separate units (e.g., circles, dots, letters, or letter like characters that are separated). Must have at least 2 to receive credit 3. Simple characters—units are simple forms including dots, circles, and short vertical or horizontal lines 4. Left-to-right orientation 5. First letter of name 6. Complex characters—the units are not simple, include pseudo and real letters 7. Random letters 8. Many letters—more than half of the letters in their first name 9. Correctly spell first name
Write CVC Words	Write CVC words: mat, bed, duck, cat, fell, hen	Score of 1 or 0 for presence or absence of each feature Maximum Score = 7 1. Random letters (verbal) 2. Scribbling 3. Random letters 4. Initial or last letter 5. Initial and last letter 6. Invented spelling: three letters/all three sounds represented 7. Correct spelling

Writing task	Task description	Scoring rubric
Picture description and sentence retell	<p>Picture description: children are shown a picture and asked to write a description of it.</p> <p>Sentence retell: examiner says a short sentence, and children are asked to orally repeat the sentence and then to write it</p>	<p>Score of 1 or 0 for presence or absence each feature</p> <p>Maximum Score = 7</p> <ol style="list-style-type: none"> <li>1. Linearity</li> <li>2. Segmentation</li> <li>3. Simple characters</li> <li>4. Left-to-right orientation</li> <li>5. Complex characters</li> <li>6. Random letters</li> <li>7. Invented spelling</li> </ol>

Puranik and Lonigan reported the following internal consistency estimates for each of the tasks: write letters: .93; write name: .92; write CVC words: .96; and, picture description and retell: .96. Inter-rater reliability was calculated for each writing feature scored for the *write name*, *write CVC words*, *picture description*, and *sentence retell* tasks, and ranged from 93 to 100%. Inter-rater reliability for the write letters task was not calculated.

Second, the scores on the letter knowledge and rhyme knowledge subtests were used as indicators of alphabet knowledge and phonological awareness, respectively. These scores were used in multiple regression analyses to determine what, if any, relationships exist among letter knowledge, phonological awareness, and emergent writing skills.

## Assessment of Literacy and Language (ALL)

The Emergent Literacy Index is a composite score of the letter knowledge and rhyme knowledge subtests. The letter knowledge subtest includes three tasks: letter identification, letter naming, and letter production. For the letter identification task, children are asked to distinguish letters from pictures and numbers and then to point to named letters. For the letter naming task, children are shown letters and asked to name them. For the letter production task, children are asked to write named letters. The rhyme knowledge subtest consists of four tasks. The first task asks children to indicate whether or not two words rhyme. The second task asks children to identify a non-rhyming word when presented with a set of three or four words. In the third task, children are asked to produce a rhyming word when given a stimulus word. Finally, in task four, children are asked to produce words that rhyme with stimulus words in a story format. The psychometric characteristics of the ALL and the subtests included in the Language Index were described in a previous section of this chapter

### Procedures

To recruit participants, advertisements announcing the study were posted at preschools, speech-language clinics, and in local newspapers throughout Florida. In addition, private speech-language clinics and preschool directors were contacted to obtain permission to send

fliers home to parents. Interested parents contacted the researcher via a phone number listed on the flier. After obtaining informed consent from children's parents, children were tested at their preschools, at a communication disorders clinic at a university located in Central Florida, children's private Speech and Language Clinics, or a study room at a public library. All participants were tested over two sessions lasting approximately 60 to 75 minutes in total. The two sessions were no more than 14 days apart. During the first session, all participants were administered the assessments in the following order:

1. hearing screening
2. nonverbal cognitive screener
3. all subtests required to calculate the language index score of the ALL, including Basic Concepts, Receptive Vocabulary, Parallel Sentence Production, and Listening Comprehension.

During the second session, all participants were administered the subtests required to calculate the Emergent Literacy Index on the ALL. The Letter Knowledge subtest was administered first, followed by the Rhyme Knowledge subtest. In addition, all children were administered the Writing Sample Protocol, in the following order: writing letters, name, CVC words, picture description, and sentence retell. The order of administration of the Emergent Literacy subtests from the ALL and the Writing Sample Protocol during the second session was determined randomly, i.e. children either received the Writing Sample Protocol followed by the Emergent Literacy subtests or vice versa.

A certified and licensed speech-language pathologist (SLP) or a trained graduate student in Communication Sciences and Disorders (CSD), who was supervised by a certified and licensed SLP, tested all participants. Assessors were not blind to participant group status.

Participants were tested approximately in the order in which they elected to participate in the study. Study recruitment began in November 2010 and continued until May 2011, with participant testing occurring from December 2010 to May 2011.

### Research Design

This study used a quasi-experimental design. In a quasi experimental design, all extraneous variables are not controlled. Further, participants were assigned to groups based on age and language status; they were not randomly assigned (Christensen, 2001).

### Data Analysis Procedures

Research Question 1: Do 4-year-old preschool children with language impairment demonstrate significant differences in their emergent writing skills when compared to their age-matched, language typical peers?

To examine between group differences (age and language status) as well as age-related and language status-related differences across groups, the results were analyzed using an independent samples *t*-test. The independent variable was language status and the dependent variables were the scores from each individual task on the Writing Sample Protocol.



Research Question 2: Do 4-year-old preschool children with language impairment demonstrate the same developmental sequence in their emergent writing skills as their age-matched language typical peers?

To determine whether a developmental sequence of emergent writing exists, the data from the Write Name, Picture Description, and Sentence Retell tasks were subjected to the Guttman scaling procedure (Guttman, 1950). The Guttman scaling procedure is used to determine if variables can be ranked in some order so that a response pattern can be captured by a single index on an ordered scale. This scale implies a linear sequence of skill development. In other words, a score on a more difficult feature implies the same score on a less difficult feature. If a high coefficient (i.e., .90 or higher) of reproducibility ( $C_R$ ) is obtained, this would provide evidence for a developmental sequence of writing skill development.

Using the Guttman scaling procedure for the write name task, the variables were entered in the following order: linearity, segmentation, presence of simple units, left to write direction, first letter of name, presence of complex characters, random letters, many letters, and conventional spelling of first name. For the composing tasks (i.e., picture description and sentence retell), the variables were entered in the following order: linearity, segmentation, presence of simple units, left-to-right direction, presence of complex characters, random letters, and invented spelling.

Research Question 3: Do language typical 4-year-old preschool children demonstrate significant differences in their emergent writing skills when compared to language typical 5-year-old preschool children?

To ascertain age-related differences in the emergent writing tasks, each writing score (i.e., letters, name writing, CVC words, picture description, and sentence retell) was entered into a

separate simple linear regression with age in months as the independent variable. In order to control for Type I errors, a Bonferroni adjustment was used, and the  $p$ -value to ascertain significant relationships was set at .01.

Research Question 4: What are the relationships among emergent writing, alphabet knowledge, phonological awareness and oral language for both children with typical language development as well as children with language impairment?

To examine relationships among emergent writing, alphabet knowledge, phonological awareness, and oral language in children with LI and their age-matched LT peers, the data from each of the five writing tasks, the Language Index Score from the ALL, the Alphabet Knowledge subtest scaled score (AK) from the ALL, and the Rhyme Knowledge subtest scaled score (RK) from the ALL were analyzed using both partial correlations and bivariate correlations. First, the data was analyzed using partial correlations with LI partialled out. Then, the data for the LI group as well as for their age-matched LT peers was analyzed separately with bivariate correlations. Finally, to examine those same relationships in LT children, the data for all LT children was analyzed using partial correlations with age in months partialled out. In order to control for Type I errors, a Bonferroni adjustment was used, and the  $p$ -value to ascertain significant relationships was set at .0065.

## CHAPTER FOUR: RESULTS

This chapter describes the results of analyses used to answer the four research questions. The chapter begins with a brief description of the children participating in the study, followed by descriptive information relative to children's performance on the writing sample tasks and interrater reliability analysis results. The chapter concludes with a presentation of results relative to each research question.

### Participants

A total of 52 preschool children who exhibited language impairment or typical language development participated in this research study. The children were placed into four groups based on their ages and scores on the Assessment of Literacy and Language (Lombardino et al., 2005) (ALL) Language Index. Children in the group with language impairment scored between 70 and 84 on the All Language Index and children in the groups with typical language scored between 85 and 115. The four groups included 11 4-year-old children with LI; 11 4-year-old language typical (LT) children, age-matched to the children with LI; 20 4-year-old children with typical language; and 21 5-year-old children with typical language. Table 9 presents the demographic characteristics of each group.

Table 9: Demographic Characteristics for each group

Group	Gender		Age in Months		
	Boys	Girls	<i>M</i>	<i>SD</i>	Range
4-Years LI	7	4	51.91	4.18	48-59
4-Years, Age-Matched LT	2	9	52.45	3.93	48-59
4-Years LT	8	12	54.25	3.80	48-59
5-Years LT	8	13	60.05	2.54	60-68

All children were recruited from preschools and community speech and language clinics throughout Florida, and all attended a preschool program. Based on parent report, all of the mothers had at least a high school education and all of the children demonstrated unremarkable developmental history in the areas of sensory, neurological, and motor performance and spoke English as the primary language in the home. All of the children passed a hearing screening and a screening for nonverbal intelligence.

### Descriptive Analyses

Table 10 presents the means and standard deviations on each of the writing tasks for each of the four groups of children included in this study. Across all writing tasks, children with LI scored lower than their age-matched LT peers. When examining the results for the 4- and 5-year-old LT children, the 5-year-old children demonstrated more advanced writing skills on the Write Letters, Write Name, Write CVC Words, and Sentence Retell tasks.

Table 10: Descriptive Statistics for Writing Tasks

<i>Writing Task</i>	4-Years LI ( <i>n</i> = 11)			4-Years Age-Matched LT ( <i>n</i> = 11)			4-Years LT ( <i>n</i> = 20)			5-Years LT ( <i>n</i> = 21)			<i>Maximum Score</i>
	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>M</i>	<i>SD</i>	<i>Range</i>	
Write Letters	2.45	3.42	0-11	9.18	6.08	0-19	10.05	5.85	0-19	14.38	5.19	6-20	20
Write Name	5.36	3.01	1-8	6.91	1.92	2-8	7.00	1.62	2-8	7.90	.62	6-9	9
Write CVC words	13.18	2.40	12-18	21.0	8.11	12-40	22.6	8.82	12-40	24.19	6.90	17-41	42
Picture Description	2.14	2.00	1-6	3.50	2.55	1-7	4.13	2.56	1-7	3.60	2.37	1-6	7
Sentence Retell	2.73	2.27	0-6	3.90	2.30	1-7	4.33	2.39	1-7	4.43	2.45	1-7	7

*Note.* Minimum Score = 0.

### Inter-rater Reliability

Prior to conducting the statistical analyses, two trained undergraduate students, blind to the participants' group assignment, independently scored all writing tasks in order to determine inter-rater reliability. The same scoring rubric (see pg. 92) was used for both the sentence retell and picture description tasks; therefore, the scores on these tasks were combined into a single "Composing" score. The initial proportion of agreements was 91% for Write Letters, 89% for Write Name, 83% for Write CVC Words, and 83% for Composing. All scoring differences were resolved with conferencing, and both coders agreed upon the final score for each task..

### Research Question 1

This section describes the results of the analyses used to answer the first research question: do 4-year-old preschool children with language impairment demonstrate significant differences in their emergent writing skills when compared to their age-matched, language typical peers? Table 11 presents the means and standard deviations for each of the groups on each of the emergent writing tasks.

Table 11: Descriptive statistics for 4-year-old children

<i>Writing Task</i>	4-Years LI ( <i>n</i> = 11)			4-Years Age-Matched LT ( <i>n</i> = 11)			<i>Maximum Score</i>
	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>M</i>	<i>SD</i>	<i>Range</i>	
Write Letters	2.45	3.42	0-11	9.18	6.08	0-19	20
Write Name	5.36	3.01	1-8	6.91	1.92	2-8	9
Write CVC words	13.18	2.40	12-18	21.0	8.11	12-40	42
Picture Description	2.14	2.00	1-6	3.50	2.55	1-7	7
Sentence Retell	2.73	2.27	0-6	3.90	2.30	1-7	7

*Note.* Minimum score = 0.

To examine differences in emergent writing skills between children with LI and their age-matched LT peers, performance on each writing task was analyzed using an independent samples *t*-test with language impairment as the independent variable. The results for each writing task are described in detail in the following sections.

### Write Letters

An independent *t*-test was conducted to determine if there was a mean difference on the Write Letters task for 4-year-old preschool children with LI when compared to their age-matched, LT peers. Prior to conducting the independent *t*-test analysis, three assumptions about group membership were tested: normality, homogeneity of variance, and independence. The

assumption of normality was tested using the Shapiro-Wilk test for normality. Results suggested that the normality assumption was met for the LT group ( $W=.917$ ,  $df=11$ ,  $p=.294$ ) but not for the group with LI ( $W=.756$ ,  $df=11$ ,  $p=.003$ ); however, slight departures from normality have minimal effects on Type I and Type II errors when using a two-tailed test (Lomax & Hahs-Vaughn, in press). The homogeneity of variance assumption was met according to Levene's test ( $F=3.619$ ,  $p=.072$ ). Because children were not randomly assigned to the LI and LT groups, the assumption of independence was not met, which may result in an increased probability of a Type I or Type II error.

Results from the independent  $t$ -test revealed significant differences between children with LI ( $M = 2.45$ ,  $SD = 3.42$ ) and their age-matched, LT peers ( $M = 9.18$ ,  $SD = 6.08$ ) on the Write Letters ( $t=3.199$ ,  $df=20$ ;  $p=.005$ ) task, which is consistent with a very large effect size  $d=1.36$  (95% CI: .44—2.29). The Write Letters task presented significant difficulties for children with LI. Some 45% were unable to write any recognizable letters compared to only 9% of their age-matched LT peers. Further, a lower percentage of children in the LI group were able to write each of the letters, ranging from 9.1 to 27.3 for the LI group and from 18.2 to 90.9 for the LT group. The greatest percentage of children in both groups wrote the letter *O* correctly, followed by the letter *S*. The letters *B*, *A*, *M*, and *C* posed the most difficulties for children with LI; whereas, the letters *K* and *D* posed the most difficulties for their age-matched LT peers. Table 12 presents the percentage of children in each group who were able to correctly write each letter.



Table 12: Percentage of Children Correctly Writing each Letter on the Write Letters Task

Letter	Group	
	4-Years LI	4-Years Age-Matched LT
B	9.1	54.5
D	18.2	45.5
S	27.3	63.6
T	18.2	63.6
O	54.5	90.9
A	9.1	81.8
H	27.3	72.7
K	18.2	18.2
M	9.1	81.8
C	9.1	54.5

### Write Name

An independent *t*-test was conducted to determine if there was a mean difference on the Write Name task for 4-year-old preschool children with LI when compared to their age-matched, LT peers. Prior to conducting the independent *t*-test analysis, three assumptions about group membership were tested: normality, homogeneity of variance, and independence. The assumption of normality was tested using the Shapiro-Wilk test for normality. Results suggested that the normality assumption was not met for either the LT group ( $W=.664, df=11, p=.000$ ) or for the group with LI ( $W=.788, df=11, p=.007$ ); however, slight departures from normality have minimal effects on Type I and Type II errors when using a two-tailed test (Lomax & Hahs-Vaughn, in press). The homogeneity of variance assumption was not met according to Levene's test ( $F=7.061, p=.015$ ); however, research has shown that the effect of unequal variances is minimal when the sample sizes are equal (Lomax & Hahs-Vaughn, in press). Because children

were not randomly assigned to the LI and LT groups, the assumption of independence was not met, which may result in an increased probability of a Type I or Type II error.

Results from the independent *t*-test did not reveal significant differences between children with LI ( $M = 5.36$ ,  $SD = 3.01$ ) and their age-matched, LT peers ( $M = 6.91$ ,  $SD = 1.92$ ) on the Write Name ( $t=1.436$ ,  $df=20$ ;  $p=.169$ ) task. On this task, 64% of the children with LI wrote the first letter of their first name and 18% correctly wrote their entire first name. Although their age-matched LT peers demonstrated more advanced name writing abilities, with 73% writing the first letter of their first name and 45% correctly writing their entire first name, these differences were not statistically significant.

### Ancillary Analysis

To date, only one other study has compared the name writing abilities of 4-year old children with LI to their age-matched LT peers (Cabell et al., 2009). In that study, Cabell, et al. (2009) scored the name writing samples using a modified version of Lieberman's (1985) 16-point scale (see pg. 35 for additional details). The modified version includes 14-points. A score of 1 is assigned to name writing samples in which children produce scribbles and do not produce any recognizable graphemes. In contrast, a score of 6 is assigned to name writing samples in which children produce discrete, letter like symbols, and 14 to samples in which they correctly write their complete first names (see Appendix D for a complete description of the scale). Using the modified scale, Cabell and colleagues reported significant differences between children with LI and their age-matched language typical peers. Because it is difficult to make comparisons of

results among studies that use different scoring criteria (Puranik & Lonigan, 2009), data from the current study were reanalyzed using the same modified version of Lieberman’s 16-point scale as completed by Cabell and colleagues (2009). To ensure inter-rater reliability, all name writing samples were scored independently by two trained coders and resulted in a within-one point agreement of 76%. The coders resolved all differences with conferencing and agreed upon the final score for each child. Table 13 presents the means and standard deviations for children’s scores on the Write Name task using Lieberman’s modified scale.

Table 13: Descriptive Statistics using Lieberman’s Modified Scoring Criteria

Group	<i>M</i>	<i>SD</i>	Range
4-Years, LI	6.73	4.78	1-13
4-Years, Age-Matched LT	11.45	4.13	1-14

An independent *t*-test was conducted to determine if there was a mean difference on the Write Name task for 4-year-old preschool children with LI when compared to their age-matched, LT peers. Prior to conducting the independent *t*-test analysis with the scores from the modified Lieberman scale (1985), three assumptions about group membership were tested: normality, homogeneity of variance, and independence. The assumption of normality was tested using the Shapiro-Wilk test for normality. Results suggested that the normality assumption was met for the children with LI ( $W=.865$ ,  $df=11$ ,  $p=.068$ ) but not for the age-matched LT children ( $W=.700$ ,  $df=11$ ,  $p=.000$ ); however, slight departures from normality have minimal effects on Type I and Type II errors when using a two-tailed test (Lomax & Hahs-Vaughn, in press). The homogeneity of variance assumption was met according to Levene’s test ( $F=1.242$ ,  $p=.278$ ). Because children

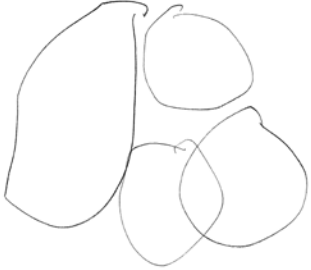
were not randomly assigned to the LI and LT groups, the assumption of independence was not met, which may result in an increased probability of a Type I or Type II error.

Results from the independent *t*-test revealed significant differences between children with LI ( $M = 6.73, SD = 4.78$ ) and their age-matched LT peers ( $M = 11.45, SD = 4.13$ ) on the Write Name task ( $t=2.482, df=20; p=.022$ ) using the modified Lieberman scale, which is consistent with a large effect size  $d=1.05$  (95% CI: .16 – 1.95). Thus, results of the ancillary analysis clearly demonstrate that the use of different scoring criteria impact study outcomes. Using Puranik and Lonigan's (2009) scoring criteria for name writing did not result in significant differences between the groups; whereas, using a modified version of Lieberman's (1985) scoring criteria did.

### Write Name Samples

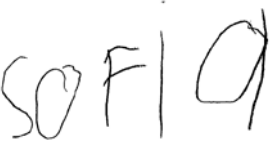
In this section, two samples of the Write Name task are presented, one from a child with LI and one from the age-matched, LT peer. After each writing sample, a completed Write Name rubric is presented and explained. Table 14 presents a Write Name sample from a child with LI as well as the completed scoring rubric.

Table 14: Write Name sample and scoring rubric for a 4-year-old child with LI

Sample	Feature	Score
	1. Linearity	0
	2. Segmentation	1
	3. Simple characters	1
	4. Left-to-right orientation	0
	5. First letter of name	0
	6. Complex characters	0
	7. Random letters	0
	8. Many letters	0
	9. Correct first name	0

This sample was assigned an overall score of 2. In this sample, the child produced circles, which is consistent with a score of 1 for “simple characters”. A score of 1 was also assigned to “segmentation”, because the characters are clearly distinguishable from one another. All other features achieved a score of 0. Neither “linearity” nor “left-to-right orientation” were present, since the characters do not appear to be organized in straight lines (i.e., linearity) and do not appear to go from left to right. A score of 0 was also assigned to “complex characters” since the characters do not look letter-like. Finally, the sample does not contain any distinguishable letters; thus, a score of 0 was assigned to “random letters”, “many letters”, and “correctly spell first name”. Table 15 presents the writing sample from the age-matched, LT peer, with the completed scoring rubric.

Table 15: Write Name sample and rubric from an age-matched LT, peer

Sample	Feature	Score
	1. Linearity	1
	2. Segmentation	1
	3. Simple characters	1
	4. Left-to-right orientation	1
	5. First letter of name	1
	6. Complex characters	1
	7. Random letters	0
	8. Many letters	1
	9. Correct first name	1

This sample was assigned an overall score of 8. The sample is organized in a straight line and goes from left-to-right; therefore, a score of 1 was assigned to both “linearity” and “left-to-right orientation”. The sample also contains distinguishable letters, thus a score of 1 was assigned for “segmentation”, “simple characters”, “complex characters”, and “random letters”. The correctly spelled name receives scores of 1 for “first letter of name”, “many letters”, and “correct first name”. Because the sample contains the correct letters of the name, it was assigned a score of 0 for “random letters”.

These two samples exemplify the kinds of differences observed in the writing samples of children with LI and their age-matched, LT peers. Approximately half of the children with LI achieved a score of 4 or less; whereas, only one of their age-matched, LT peers achieved a score of 4 or less. A score of 4 indicates that the children demonstrated the features of linearity, segmentation, simple characters, and left-to-right orientation.

## Write CVC Words

An independent *t*-test was conducted to determine if there were mean differences on the Write CVC Words task for 4-year-old children with LI when compared to their age-matched, LT peers. Prior to conducting the independent *t*-test analysis, three assumptions about group membership were tested: normality, homogeneity of variance, and independence. The assumption of normality was tested using the Shapiro-Wilk test for normality and was met for the age-matched LT children ( $W=.893$ ,  $df=11$ ,  $p=.153$ ) but not for the children with LI ( $W=.539$ ,  $df=11$ ,  $p=.000$ ); however, slight departures from normality have minimal effects on Type I and Type II errors when using a two-tailed test (Lomax & Hahs-Vaughn, in press). The homogeneity of variance assumption was not met according to Levene's test ( $F=4.993$ ,  $p=.037$ ); however, research has shown that the effect of unequal variances is minimal when the sample sizes are equal (Lomax & Hahs-Vaughn, in press). Because children were not randomly assigned to the LI and LT groups, the assumption of independence was not met, which may result in an increased probability of a Type I or Type II error.

Results from the independent *t*-test revealed significant differences between children with LI ( $M = 13.18$ ,  $SD = 2.40$ ) and their age-matched, LT peers ( $M = 21.0$ ,  $SD = 8.11$ ) on the Write CVC Words ( $t=3.065$ ;  $df=20$ ;  $p=.010$ ) task, which is consistent with a very large effect size  $d=1.31$  (95% CI: .39 – 2.23). Children with LI demonstrated significant difficulty on the Write CVC words task. Some 72.7% produced only scribbling on all words they wrote. None of the children with LI were able to write words using both the initial and final letters of the word or to use invented spelling when writing the words, and only 18.2% of the children wrote words using random letters. In contrast, only 20% of their age-matched LT peers wrote all words using only

scribbles, 75% wrote at least the initial or final letters of at least one word, and 30% were able to correctly write all of the letters in at least one word. Table 16 shows the percentage of children in each group who wrote each word using scribbling, the initial or final letter, the initial and final letter, invented spelling, or correct spelling.



Table 16: Percentage of Children using Scribbles versus Letters for each CVC Word

Word	Use of letters	4-Years LI	4-Years Age Matched LT
Mat	Scribbling	90.9	36.4
	Initial or Final Letter	0.0	36.4
	Initial and Final Letter	0.0	18.2
	Invented Spelling	0.0	0.0
	Correct Spelling	0.0	9.1
Bed	Scribbling	81.8	36.4
	Initial or Final Letter	0.0	36.4
	Initial and Final Letter	0.0	9.1
	Invented Spelling	0.0	9.1
	Correct Spelling	0.0	0.0
Duck	Scribbling	81.8	45.5
	Initial or Final Letter	0.0	27.3
	Initial and Final Letter	0.0	0.0
	Invented Spelling	0.0	9.1
	Correct Spelling	0.0	0.0
Cat	Scribbling	81.8	45.5
	Initial or Final Letter	9.1	18.2
	Initial and Final Letter	0.0	0.0
	Invented Spelling	0.0	9.1
	Correct Spelling	0.0	18.2
Fell	Scribbling	72.7	18.2
	Initial or Final Letter	0.0	45.5
	Initial and Final Letter	0.0	0.0
	Invented Spelling	0.0	0.0
	Correct Spelling	0.0	9.1
Hen	Scribbling	81.8	18.2
	Initial or Final Letter	0.0	18.2
	Initial and Final Letter	0.0	0.0
	Invented Spelling	0.0	0.0
	Correct Spelling	0.0	9.1

## Composing Tasks

An independent *t*-test was conducted to determine if there were mean differences on the composing tasks for 4-year-old preschool children with LI when compared to their age-matched, LT peers. Prior to conducting the independent *t*-test analysis, three assumptions about group membership were tested: normality, homogeneity of variance, and independence. The assumption of normality was tested using the Shapiro-Wilk test for normality. On the Picture Description Task, the assumption of normality was not met for either the age-matched LT children ( $W=.798$ ,  $df=11$ ,  $p=.009$ ) or for the children with LI ( $W=.620$ ,  $df=11$ ,  $p=.000$ ). On the Sentence Retell task, the assumption of normality was met for the age-matched LT children ( $W=.894$ ,  $df=11$ ,  $p=.157$ ), but not for the children with LI ( $W=.828$ ,  $df=11$ ,  $p=.022$ ); however, slight departures from normality have minimal effects on Type I and Type II errors when using a two-tailed test (Lomax & Hahs-Vaughn, in press). According to Levene's test, the homogeneity of variance assumption was met for both composing tasks (Picture Description:  $F=4.220$ ,  $p=.053$ ; Sentence Retell:  $F=.024$ ,  $p=.879$ ). Because children were not randomly assigned to the LI and LT groups, the assumption of independence was not met, which may result in an increased probability of a Type I or Type II error.

Results from the independent *t*-test did not reveal significant differences between children with LI ( $M = 2.14$ ,  $SD = 2.00$ ) and their age-matched LT, peers ( $M = 3.50$ ,  $SD = 2.55$ ) on the Picture Description task ( $t=1.395$ ,  $df=20$ ;  $p=.178$ ) task. A similar comparison between children with LI ( $M = 2.73$ ,  $SD = 2.27$ ) and their age-matched, LT peers ( $M = 3.90$ ,  $SD = 2.30$ ) on the Sentence Retell task ( $t=1.212$ ,  $df=20$ ;  $p=.240$ ), did not reveal significant differences either. Both the children with LI and their age-matched, LT peers demonstrated difficulties on the

composing tasks. On a scale of 7, children with LI had an average score of 2.1 on the Picture Description task and 2.7 on the Sentence Retell task. Although the LT children demonstrated more advanced skills, averaging 3.5 and 3.9, respectively, these differences were not statistically significant. On these tasks, 36% of the children with LI wrote letters for at least one of the stimuli; whereas, 64% of the LT children did so. Table 17 presents children's performance by group on each writing feature.

#### Ancillary Analysis

The non-significant results on the Picture Description and the Sentence Retell composing tasks seemed contradictory to expectations. A post hoc power analysis revealed that the achieved power was .26 and .21 for the two emergent writing tasks, respectively, indicating a high probability of a Type II error. To obtain the same effect size with power of .80, thereby reducing the likelihood of a Type II error, sample sizes of at least 36 and 48, respectively, would be necessary.

Table 17: Percentage of Children Achieving a Score of 1 for each Writing Feature for each Composing Task

Task	Group	Writing feature scored						
		Linearity	Segmentation	Simple Characters	Left-to-right Orientation	Complex Characters	Random Letters	Invented Spelling
Picture Description 1	4-Years LI	27.3	36.4	63.6	27.3	18.2	18.2	0.0
	4-Years Age-Matched LT	45.5	45.5	63.4	45.5	45.5	36.4	18.2
Picture Description 2	4-Years LI	18.2	27.3	100.0	18.2	18.2	18.2	0.0
	4-Years, Age-Matched LT	45.5	54.5	100.0	54.5	45.5	36.4	27.3
Sentence Retell 1	4-Years LI	27.3	54.5	90.9	36.4	27.3	27.3	0.0
	4-Years Age-Matched LT	45.5	45.5	100.0	54.5	54.5	45.5	18.2
Sentence Retell 2	4-Years LI	36.4	45.5	90.9	36.4	36.4	36.4	0.0
	4-Years Age-Matched LT	63.6	63.6	100.0	72.7	54.5	45.5	18.2

## Summary

This study evaluated emergent writing skills of children with LI and children with typical language development. The first hypothesis stated that children with LI will demonstrate less advanced emergent writing skills when compared to the age-matched LT peers. Although the children with LI demonstrated less advanced emergent writing skills across all tasks measured, not all of the differences were statistically significant. Significant differences were observed for the Write Letters and Write CVC Words tasks.

### Research Question 2

This section will describe the results of the analyses used to answer the second research question: do 4-year-old preschool children with language impairment demonstrate the same developmental sequence in their emergent writing skills as their age-matched language, typical peers? In order to examine whether the children with LI demonstrate the same developmental sequence in use of writing features as their age-matched LT peers, the Guttman scaling procedure (Guttman, 1950) was used to evaluate performance on both the Write Name and composing tasks. The Guttman scaling procedure rank orders items so that a score of 1 on a higher ranked item implies a score of 1 on the items ranked below it. For example, performance on the Write Name task is scored using nine sequenced features as presented in Table X. As Table X demonstrates “linearity” is the lowest ranked feature and “correctly spell first name” is

the highest. Therefore, it is possible to determine a linear sequence of skill development by observing the features produced correctly. To meet the criterion for a Guttman scale, the coefficient of reproducibility ( $C_R$ ) must be higher than .90, which is calculated as follows:  $1 -$  [the number of error responses (E) divided by the total number of responses (N)] or  $1 - (E/N)$ . An error response does not follow the hypothesized sequence of development. For example, Table 18 includes hypothetical scores on the Write Name task.

Table 18: Hypothetical Write Name task scores

Feature	Score
1. Linearity	1
2. Segmentation	1
3. Simple characters	1
4. Left-to-Right orientation	1
5. First letter of name	0
6. Complex characters	1
7. Random letters	0
8. Many letters	0
9. Correctly spell first name	0

In this example, feature 5 would be counted as an error since feature 6 was scored as a 1. Only scores of zero below the highest ranked score of 1 are counted as errors. Thus, the error score for this hypothetical example would be 1, and the  $C_R$  would be .89 [ $1 - (1/9)$ ].

The results of the Write Name task met the criteria for a coefficient of reproducibility ( $C_R$ ) of .90 or higher and implied the following developmental sequence for both groups: (1) linearity, (2) segmentation, (3) presence of simple units, (4) left to write direction, (5) first letter of name, (6) presence of complex characters, (7) random letters, (8) many letters, and (9) conventional spelling of first name. The  $C_R$  for the composing tasks was lower than .90;

therefore, significant evidence does not exist for the following developmental sequence: (1) linearity, (2) segmentation, (3) presence of simple units, (4) left-to-right direction, (5) presence of complex characters, (6) random letters, (7) invented spelling. Table 19 presents the  $C_R$  for the Write Name task and each of the composing tasks for the children with LI and their age-matched, LT peers.

Table 19:  $C_R$  for each Writing Task for each Group

Group	Writing Task				
	Name <sup>a</sup>	PD1 <sup>b</sup>	PD2 <sup>c</sup>	SR1 <sup>d</sup>	SR2 <sup>e</sup>
4-Years LI	.94	.82	.80	.87	.87
4-Years Age-Matched LT	.92	.85	.85	.85	.89

<sup>a</sup>Name=Write Name Task; <sup>b</sup>PD1=Picture Description 1 Task; <sup>c</sup>PD2=Picture Description 2 Task; <sup>d</sup>SR1=Sentence Retell Task 1; <sup>e</sup>SR2=Sentence Retell Task 2

The second hypothesis stated that children with LI will demonstrate the same developmental sequence in their emergent writing skills as their age-matched, LT peers. Contrary to this prediction, the developmental sequence was noted for name writing but not for composing.

### Research Question 3

This section will describe the results of the analyses used to answer the third research question: do language typical 4-year-old preschool children demonstrate significant differences

in their emergent writing skills when compared to language typical 5-year-old preschool children? To examine age-related differences in the emergent writing skills of language typical 4- and 5-year-old children, data for the dependent writing measures were analyzed using five simple regression models, with each writing score (i.e., letters, name writing, CVC words, picture description, and sentence retell) as the dependent variable for each model. In all models, age in months was the independent variable. In order to control for Type I errors, a Bonferroni adjustment was used, and the  $p$ -value to ascertain significant relationships was set at .01 (.05/5). The results for each writing task are reviewed in detail in the following sections.

### Write Letters

A simple linear regression was used to determine whether age was a significant predictor in children's ability to write letters. A review of the scatterplot of the studentized residuals against the independent variable reveals that the assumptions of independence, linearity, and fixed values of  $X$  were all met. Further review of the scatterplot suggests a slight increase in the residuals from left to right across the  $X$  axis, indicating a slight violation of the homogeneity of variance assumption. Small violations of the homogeneity of variance assumption will have a small effect on Type II errors (Lomax & Hahs-Vaughn, in press). Results from the Shapiro-Wilk test for normality indicated that the assumption of normality was also met ( $W=.948$ ;  $df=40$ ;  $p=.061$ ). A post hoc power analysis revealed an achieved power of .9998, indicating a very small possibility of a Type II error.



The results suggest that a significant proportion of the total variation in letter writing ability is predicted by age [ $F(1,39) = 12.626, p=.001$ ]. The unstandardized slope (.532) and standardized slope (.495) are significantly different from zero ( $t=3.553, p=.001$ ), and the confidence interval around the unstandardized slope does not include zero (.229, .834), further suggesting that age is a significant predictor of letter writing ability. Finally, multiple  $R$  squared indicates that approximately 25% of the variance in letter writing ability is predicted by age, which is suggestive of a medium effect (Cohen, 1988). Table 20 presents the results of the regression model.

Table 20: Predictors of letter writing

Variable	Model $B$
Constant	18.97*
Age	.532**
$R^2$	.25
$F$	12.63

\* $p < .05$ . \*\* $p < .001$

The LT children showed significant age-related improvement in their ability to write letters. Of the 4-year-old children, 30% wrote five or more unrecognizable letters, compared to only 9% of the 5-year-old children. The greatest percentage of 4-year-old children wrote the letter *O*, followed by *M*, *A*, *S*, and *T*. The greatest percentage of 5-year-old children wrote the letter *C*, followed by the letters *B*, *D*, and *T*. The letter *D* posed the most difficulty for the 4-year-old children; whereas, the letter *M* posed the most difficulty for the 5-year-old children. Table 21 presents the percentage of children in each group who correctly wrote each letter.

Table 21: Percentage of Children Correctly Writing each Letter

Letter	4-Years LT (n=20)	5-Years LT (n=21)
B	65.0	90.5
D	55.0	95.2
S	75.0	85.7
T	75.0	90.5
O	90.0	90.5
A	75.0	90.5
H	65.0	85.7
K	40.0	85.7
M	75.0	76.2
C	65.0	100

### Write Name

A simple linear regression was used to determine whether age was a significant predictor in children's ability to write their names. A review of the scatterplot of the studentized residuals against the independent variable revealed that the assumptions of independence, homogeneity of variance, linearity, and fixed values of  $X$  were all met. Results from the Shapiro-Wilk test for normality indicated some evidence of non-normality ( $W=.847$ ;  $df=40$ ;  $p=.000$ ), which is supported by the kurtosis value (4.70) that is larger than the absolute value of 2. One reason for the non-normal distribution may be a result of ceiling effects. Of the 21 children in the 5-year-old LT group, 17 achieved a score of 8 and 2 achieved a score of 9 out of a maximum score of 9. A post hoc power analysis revealed an achieved power of .996, indicating a very small possibility of a Type II error.

The results suggest that a significant proportion of the total variance in name writing ability is predicted by age [ $F(1,39) = 8.436, p=.006$ ]. The unstandardized slope (.099) and standardized slope (.422) are significantly different from zero ( $t=2.904, p=.006$ ), and the confidence interval around the unstandardized slope does not include zero (.03, .160), further suggesting that age is a significant predictor of name writing ability. Finally, multiple  $R$  squared indicates that 18% of the variance in name writing ability is predicted by age, suggesting a small effect (Cohen, 1988). Table 22 presents the results of the regression model.

Table 22: Predictors of name writing

Variable	Model $B$
Constant	1.63
Age	.10*
$R^2$	.18
$F$	8.44

\* $p < .05$ .

Children demonstrated age-related advances in their name writing abilities. Of the 4-year-old children, 75% wrote the first letter of their first names and 50% wrote their entire first name correctly, compared to 95% and 85%, respectively, of the 5-year-old children.

## Write CVC Words

A simple linear regression was used to determine whether age was a significant predictor in LT children's ability to write CVC words. A review of the scatterplot of the studentized residuals against the independent variable revealed that the assumptions of independence, homogeneity of variance, linearity, and fixed values of  $X$  were all met. Results from the Shapiro-Wilk test for normality indicated that the assumption of normality was also met ( $W=.946$ ;  $df=40$ ;  $p=.052$ ). A post-hoc power analysis revealed an achieved power of .233, indicating the high probability of a Type II error. Table 23 presents the results of the regression model.

Table 23: Predictors of word writing

Variable	Model $B$
Constant	12.99
Age	.177
$R^2$	.02
$F$	.599

The results suggest that age was not a significant predictor of the total variation in CVC word writing ability [ $F(1, 39) = 0.599$ ,  $p=.444$ ]. Although the results were not significant, the 5-year-old children demonstrated more advanced skills than the 4-year-old children. Of the 4-year-old children, 20% wrote all CVC words using only scribbles and 65% wrote the initial or final letters of at least one word. This compared to the 5-year-old children, of whom only 5% wrote all CVC words using scribbles and 85% wrote the initial or final letters of at least one word.

Table 24 presents the percentage of LT children in each group who wrote each word using scribbling, the initial or final letter, the initial and final letter, invented spelling, or correct spelling.

Table 24: Percentage of Language Typical Children using each Writing Feature

Word	Use of letters	4-Years LT	5-Years LT
Mat	Scribbling	30.0	10.0
	Initial or Final Letter	35.0	23.8
	Initial and Final Letter	15.0	4.8
	Invented Spelling	0.0	4.8
	Correct spelling	15.0	19.0
Bed	Scribbling	40.0	14.3
	Initial or Final Letter	30.0	33.3
	Initial and Final Letter	5.0	0.0
	Invented Spelling	5.0	19.0
	Correct spelling	15.0	14.3
Duck	Scribbling	35.0	10
	Initial or Final Letter	30.0	23.8
	Initial and Final Letter	0.0	0
	Invented Spelling	15.0	4.8
	Correct spelling	0.0	4.8
Cat	Scribbling	35.0	4.8
	Initial or Final Letter	25.0	52.4
	Initial and Final Letter	0.0	0.0
	Invented Spelling	5.0	4.8
	Correct spelling	30.0	23.8
Fell	Scribbling	20.0	9.5
	Initial or Final Letter	40.0	38.1
	Initial and Final Letter	5.0	0.0
	Invented Spelling	5.0	14.3
	Correct spelling	5.0	0.0
Hen	Scribbling	20.0	4.8
	Initial or Final Letter	20.0	23.8
	Initial and Final Letter	5.0	4.8
	Invented Spelling	0.0	9.5
	Correct spelling	10.0	9.5

### Ancillary Analysis

Previous research has reported age-related differences between 4- and 5-year-old children on the Write CVC Words task (Puranik & Lonigan, 2009); thus, the current findings seemed contradictory. A post hoc power analysis revealed an achieved power of .10, indicating a high probability of a Type II error. In addition, the differences between the 4- and 5-year-old children reported by Puranik and Lonigan yielded an effect size of  $d=.41$  (95% CI = .19 - .63); whereas, the effect size obtained in the current study was  $d=.20$  (95% CI = -.41 - .82). To obtain the same effect size as reported by Puranik and Lonigan, a sample size of at least 75 is required.

### Composing Tasks

Simple linear regressions were used to determine whether age was a significant predictor in children's ability to write sentences. A review of the scatterplot of the studentized residuals against the independent variable revealed that the assumptions of independence, homogeneity of variance, linearity, and fixed values of  $X$  were all met. Results from the Shapiro-Wilk test for normality for the Picture Description task indicated some evidence of non-normality ( $W=.809$ ;  $df=40$ ;  $p=.000$ ); however, this finding was not supported by the skewness value (-.154) or the kurtosis value (-1.849), both of which were smaller than the absolute value of 2. The Cook's statistic (-.938), which is smaller than 1, did not provide evidence of any outliers (Field, 2009). Results from the Shapiro-Wilk test for normality for the Sentence Retell task also indicated some evidence of non-normality ( $W=.815$ ;  $df=40$ ;  $p=.000$ ); however, this finding was not supported by

the skewness value (-.694) or the kurtosis value (-1.292), both of which were smaller than the absolute value of 2. The Cook's statistic (.170) did not provide evidence of any outliers (Field, 2009). Finally, post hoc power analyses revealed achieved power of .055 for the Picture Description task and .40 for the Sentence Retell task. Tables 25 and 26 present the results of the regression model for the Picture Description and Sentence Retell tasks.

Table 25: Predictors of Picture Description

Variable	Model <i>B</i>
Constant	3.29
Age	.01
$R^2$	.00
$F$	.02

Table 26: Predictors of Sentence Retell

Variable	Model <i>B</i>
Constant	.02
Age	.074
$R^2$	.03
$F$	1.16

The results suggest that age was not a significant predictor of the total variation in either the picture description task [ $F(1,39) = 0.018, p=.894$ ] or the sentence retell task [ $F(1,39) = 0.1159, p=.288$ ]. Both the 4- and 5-year-old LT children demonstrated difficulty with the composing tasks. On these tasks, 70% of the 4-year-old LT children wrote letters only and 30% used invented spelling for at least one of the stimuli; whereas, 76% and 33%, respectively, of the



5-year-old LT children did so. Table 27 presents children's performance by each group on each writing feature.


Table 27: Percentage of Language Typical Children Achieving a Score of 1 for each Writing Feature on each Composing Task

Task	Group	Writing Feature						
		Linearity	Segmentation	Simple Characters	Left-to-right Orientation	Complex Characters	Random Letters	Invented Spelling
Picture	4-Years LT	55.0	65.0	95.0	55.0	60.0	50.0	25.0
Description 1	5-Years LT	42.9	52.4	100.0	42.9	47.6	38.1	19.0
Picture	4-Years LT	55.0	65.0	95.0	65.0	60.0	55.0	25.0
Description 2	5-Years LT	47.6	66.7	95.2	57.1	52.4	42.9	14.3
Sentence	4-Years LT	60.0	60.0	95.0	65.0	65.0	60.0	20.0
Retell 1	5-Years LT	66.7	71.4	95.2	66.7	66.7	71.4	9.5
Sentence	4-Years LT	70.0	70.0	95.0	75.0	60.0	55.0	15.0
Retell 2	5-Years LT	66.7	66.7	95.2	66.7	66.7	66.7	9.5

## Composing Samples


In this section, two samples from the Sentence Retell task will be presented, one from a 4-year-old LT child and one from a 5-year-old LT child. Table 28 presents a Sentence Retell sample from a 4-year-old LT child and the completed scoring rubric.

Table 28: Sentence Retell sample and scoring rubric for a 4-year-old LT child

Sample	Feature	Score
	1. Linearity	0
	2. Segmentation	0
	3. Simple characters	1
	4. Left-to-right orientation	0
	5. Complex characters	0
	6. Random letters	0
	7. Invented spelling	0

In this sample, the child was asked to repeat and then to write the following sentence: “The boy is wearing a red cap”. The sample was assigned an overall score of 1. As can be seen, the sample only contains a single, simple character; therefore, scores of 0 were assigned to “linearity”, “segmentation”, and “left-to-right orientation”. The character in this sample is not clearly a letter or pseudo letter; therefore, a score of 1 was assigned to “simple characters”, and a score of 0 was assigned to “complex characters,” “random letters,” and “invented spelling”. Table 29 presents a sample from the same Sentence Retell task from a 5-year-old LT child.

Table 29: Sentence Retell sample and scoring rubric for a 5-year-old LT child

Sample	Feature	Score
	1. Linearity	1
	2. Segmentation	1
	3. Simple characters	1
	4. Left-to-right orientation	1
	5. Complex characters	1
	6. Random letters	1
	7. Invented spelling	0

This sample was assigned an overall score of 8. The sample contains clearly distinguishable letters that are organized in straight lines and go from left-to-right; therefore, a score of 1 was assigned to “linearity”, “segmentation”, “simple characters”, “left-to-right orientation”, “complex characters”, and “random letters”. The sample was not assigned a score of 1 for “invented spelling”, since there is no discernable relationship between the letters produced and the stimulus, “The boy is wearing a red cap”.

### Summary

The third hypothesis stated that LT 4-year-old-children will demonstrate less advanced emergent writing skills on all emergent writing tasks when compared to LT 5-year-old-children. This hypothesis was supported in part. Although the 5-year-old LT children demonstrated better performance than the 4-year old writing tasks except the Picture Description Task, significant

differences were observed between the two groups on the Write Letters and Write Name tasks only.

#### Research Question 4

This section will describe the results of the analyses used to answer the fourth research question: what are the relationships among emergent writing, alphabet knowledge, phonological awareness and oral language for both children with typical language development as well as children with language impairment? To examine these relationships, the data from each of the five writing tasks, the Language Index Score from the ALL (ALL), the Alphabet Knowledge subtest scaled score (AK) from the ALL, and the Rhyme Knowledge subtest scaled score (RK) from the ALL were analyzed using both partial correlations and bivariate correlations. First, the data were analyzed using partial correlations with LI partialled out. In other words, the influence of language impairment was removed from the measures used in the correlations. Then, the data for the LI group as well as for their age-matched LT peers were analyzed separately with bivariate correlations. Finally, to examine those same relationships in LT children, the data for all LT children were analyzed using partial correlations with age in months partialled out. In other words, the influence of age was removed from the dependent measures. In order to control for Type I errors, a Bonferroni adjustment was used, and the  $p$ -value to ascertain significant relationships was set at .0065 (.05/8).

Table 30 presents the significant partial correlations with LI partialled out. As shown in Table 30, the results revealed significant relationships between the Write Letters task and the Write CVC Words, Picture Description, and Sentence Retell tasks. In addition, the results also revealed a significant relationship between the Write Letters task and oral language (indexed by the Language Index score of the ALL) and between the Write Letters task and alphabet knowledge (indexed by the Alphabet Knowledge subtest of the ALL). Finally, the Write CVC Words task shared a significant relationship with AK. All of the significant correlations are consistent with a large effect (Cohen, 1988).

Table 30: Partial Correlations, LI Partialled out

	Name <sup>b</sup>	Words <sup>c</sup>	PD <sup>d</sup>	SR <sup>e</sup>	ALL <sup>f</sup>	AK <sup>g</sup>	RK <sup>h</sup>
Letters <sup>a</sup>	.479	<b>.809*</b>	<b>.813*</b>	<b>.800*</b>	<b>.594*</b>	<b>.728*</b>	.533
Name <sup>b</sup>	--	.325	.423	.476	.185	.328	.361
Words <sup>c</sup>		--	<b>.683*</b>	<b>.658*</b>	<b>.601*</b>	<b>.595*</b>	.570
PD <sup>d</sup>			--	<b>.767*</b>	<b>.587*</b>	.514	.540
SR <sup>e</sup>				--	.440	.538	.499
ALL <sup>f</sup>					--	.446	.548
AK <sup>g</sup>						--	.282

Note. n=22 for all comparisons.

<sup>a</sup>Letters=Write Letters task; <sup>b</sup>Name=Write Name task; <sup>c</sup>Words=Write CVC Words task;

<sup>d</sup>PD=Picture Description tasks; <sup>e</sup>SR=Sentence Retell tasks; <sup>f</sup>ALL=Assessment of Literacy and Language, Language Index; <sup>g</sup>AK= Assessment of Literacy and Language, Letter Knowledge Subtest; <sup>h</sup>RK= Assessment of Literacy and Language, Rhyme Knowledge Subtest

\* $p < .00625$

Bivariate correlations were conducted to examine the relationships among the variables for the LI group. Table 31 presents the results of the bivariate correlations. Similar to the results obtained from the partial correlation with LI partialled out, results revealed significant relationships of the Write Letters task to the Write CVC Words and Picture Description tasks.

Unlike the results from the partial correlations with LI partialled out, however, the results of the bivariate correlations for the LI group did not reveal significant relationships of the Write Letters task to the Sentence Retell task, oral language, or alphabet knowledge, nor did the Write CVC words task share a significant relationship with AK. Finally, all of the significant correlations are consistent with a large effect (Cohen, 1988).

Table 31: Bivariate Correlations for the LI Group

	Name <sup>b</sup>	Words <sup>c</sup>	PD <sup>d</sup>	SR <sup>e</sup>	ALL <sup>f</sup>	AK <sup>g</sup>	RK <sup>h</sup>
Letters <sup>a</sup>	.439	<b>.879*</b>	<b>.882*</b>	.758	.081	.541	.349
Name <sup>b</sup>	--	.474	.414	.542	.039	.090	.363
Words <sup>c</sup>	--	--	<b>.941*</b>	<b>.780*</b>	-.086	.384	.161
PD <sup>d</sup>			--	.740	-.074	.345	.344
SR <sup>e</sup>				--	-.254	.217	.206
ALL <sup>f</sup>					--	-.082	.392
AK <sup>g</sup>						--	-.114

Note. n=11 for all comparisons.

<sup>a</sup>Letters=Write Letters task; <sup>b</sup>Name=Write Name task; <sup>c</sup>Words=Write CVC Words task;

<sup>d</sup>PD=Picture Description tasks; <sup>e</sup>SR=Sentence Retell tasks; <sup>f</sup>ALL=Assessment of Literacy and Language, Language Index; <sup>g</sup>AK= Assessment of Literacy and Language, Letter Knowledge Subtest; <sup>h</sup>RK= Assessment of Literacy and Language, Rhyme Knowledge Subtest

- $p < .00625$

Bivariate correlations were conducted to examine the relationships among the variables for the age-matched LT group. Table 32 presents the significant bivariate correlations. Similar to the results obtained from the partial correlation with LI partialled out, results revealed significant relationships of the Write Letters task to the Write CVC Words Picture Description, and Sentence Retell tasks as well as significant relationships of the Write Letters task to oral language and alphabet knowledge. All of the significant correlations are consistent with a large effect (Cohen, 1988).

Table 32: Bivariate Correlations in Age-Matched, Language Typical Group

	Name <sup>b</sup>	Words <sup>c</sup>	PD <sup>d</sup>	SR <sup>e</sup>	ALL <sup>f</sup>	AK <sup>g</sup>	RK <sup>h</sup>
Letters <sup>a</sup>	.635	<b>.821*</b>	<b>.797*</b>	<b>.870*</b>	<b>.773*</b>	<b>.808*</b>	.597
Name <sup>b</sup>	--	.411	.490	.405	.368	.647	.438
Words <sup>c</sup>		--	.687	.737	.753	.681	.670
PD <sup>d</sup>			--	<b>.797*</b>	<b>.914*</b>	.609	.641
SR <sup>e</sup>				--	<b>.885*</b>	<b>.776*</b>	.699
ALL <sup>f</sup>					--	.680	.608
AK <sup>g</sup>						--	.457

Note. n=11 for all comparisons.

<sup>a</sup>Letters=Write Letters task; <sup>b</sup>Name=Write Name task; <sup>c</sup>Words=Write CVC Words task;

<sup>d</sup>PD=Picture Description tasks; <sup>e</sup>SR=Sentence Retell tasks; <sup>f</sup>ALL=Assessment of Literacy and Language, Language Index; <sup>g</sup>AK= Assessment of Literacy and Language, Letter Knowledge Subtest; <sup>h</sup>RK= Assessment of Literacy and Language, Rhyme Knowledge Subtest

\*  $p < .00625$

Finally, partial correlations with age in months partialled out were used to examine the relationships among the dependent variables for the LT children. Table 33 presents the results of the partial correlations. Significant relationships between the Write Letters task and the Write Name, Write CVC Words, Picture Description, and Sentence Retell tasks were found. All of the correlations were consistent with a large effect (Cohen, 1988). In addition, the results revealed significant relationships between the Write Letters task and alphabet knowledge, which was also consistent with a large effect (Cohen, 1988). Finally, a significant relationship of oral language to rhyme knowledge was revealed and is consistent with a large effect (Cohen, 1988).

According to Cohen (1988), significant correlations between .3 and .5 are consistent with a medium effect (e.g., Write CVC Words and Picture Description); whereas, correlations of .50 and larger are consistent with a large effect (e.g., Picture Description and Sentence Retell).



Table 33: Partial Correlations: Language Typical Children, Age in Months Partialled out

	Name <sup>b</sup>	Words <sup>c</sup>	PD <sup>d</sup>	SR <sup>e</sup>	ALL <sup>f</sup>	AK <sup>g</sup>	RK <sup>h</sup>
Letters <sup>a</sup>	<b>.536*</b>	<b>.638*</b>	<b>.503*</b>	<b>.571*</b>	.151	<b>.571*</b>	.151
Name <sup>b</sup>	--	.400	.286	.296	.247	<b>.431*</b>	.230
Words <sup>c</sup>		--	<b>.475*</b>	<b>.500*</b>	.368	<b>.446*</b>	.280
PD <sup>d</sup>			--	<b>.649*</b>	.070	<b>.486*</b>	.217
SR <sup>e</sup>				--	.304	.369	.237
ALL <sup>f</sup>					--	.230	<b>.516*</b>
AK <sup>g</sup>						--	.198

Note. n=41 for all comparisons.

<sup>a</sup>Letters=Write Letters task; <sup>b</sup>Name=Write Name task; <sup>c</sup>Words=Write CVC Words task;

<sup>d</sup>PD=Picture Description tasks; <sup>e</sup>SR=Sentence Retell tasks; <sup>f</sup>ALL=Assessment of Literacy and Language, Language Index; <sup>g</sup>AK= Assessment of Literacy and Language, Letter Knowledge Subtest; <sup>h</sup>RK= Assessment of Literacy and Language, Rhyme Knowledge Subtest

\* $p < .00625$

The fourth hypothesis stated that there would be significant positive relationships among emergent writing and alphabet knowledge, phonological awareness, and oral language.

Contradictory to the prediction, this hypothesis was only partially supported. Significant positive relationships were found between AK and the following: (1) letter writing for all LT children; (2) name writing for 5-year-old LT children; (3) word writing for all children, LI and LT; (4) picture description for all LT children. No significant relationships were found between phonological awareness and emergent writing tasks. Finally, significant positive relationships were found between oral language and the following: (1) PA for all LT children; (2) letter writing, word writing, and sentence writing for all LT children. No significant relationships were found between oral language and AK for all LT children and between oral language and AK, PA, and emergent writing for children with LI.

## Conclusions

This study is the first to examine emergent writing skills in both LI and LT preschool children using a variety of writing tasks. Consistent with research findings for other emergent literacy skills (Boudreau & Hedberg, 1999; Gillam & Johnston, 1985; Kahmi, Lee, & Nelson, 1985; Magnusson & Naucler, 1990; Nathan, Stackhouse, Goulandris, & Snowling, 2004), children with LI typically demonstrated weaker emergent writing skills when compared to their age-matched LT peers. Specifically, children with LI demonstrated significant difficulties on the Write Letters, Write Name and Write CVC Words tasks. Results also support the conclusion that children with LI pass through the same developmental sequence in writing features as their age-matched LT peers when acquiring name writing skills.

With regard to age-related differences among LT children, the results are consistent with other research findings (Puranik & Lonigan, 2009). Five-year-old LT children demonstrated advanced letter and name writing skills when compared to 4-year-old LT children. No age-related differences were found for the Write CVC Words task or either of the composing tasks. Finally, when examining the relationships among the dependent variables in both children with LI as well as their LT peers, letter writing ability was consistently related to other writing tasks. In addition, letter writing ability was consistently related to both AK and oral language in the LT groups, but not in the LI group.

## CHAPTER FIVE: DISCUSSION

The purpose of this study was two-fold: to compare the emergent writing skills of children with LI to their LT age-matched peers and to attempt to explain the relationships among emergent literacy components and oral language in both children with LI as well as LT children. Overall, the results indicate that children with LI have difficulty with emergent writing tasks when compared to their LT age-matched peers. Further, the results suggest significant relationships among AK, PA, and emergent writing. These results will be discussed in detail in the following sections. The chapter will conclude with suggestions for future research.

### Emergent Writing Differences between Children with Language Impairment and Language Typical Children

When compared to their age-matched LT peers, children with LI performed more poorly on all emergent writing tasks but demonstrated significant difficulty on tasks involving writing letters and writing CVC words. Similar to other research demonstrating that typically developing children use superordinate features (e.g. linearity, presence of units, and regularity of blanks) in their writing samples from 4-years of age (Jensen, 1990; Tolchinsky-Landsmann & Levin, 1985), children with LI also produce these same features in their writing. Approximately half of the children with LI were able to produce linear, segmented, complex characters when writing sentences, and more than half were able to do so when writing their names.

Results from the Write Letters task revealed that the largest percentage of LT children wrote the letters *O* and *A*. The largest percentage of children with LI wrote the letters *O* and *S*. Research examining the order in which LT preschool children learn both upper- and lowercase letters has shown that the largest percentage of children know the uppercase letters *A*, *O*, *X* and the lowercase letters *o*, *s*, and *x* (Justice, et al., 2006; Turnbull, et al., 2010). The letter *X* was not tested in the current study. Thus, the results of the current study are consistent with previous findings and suggest that the largest percentage of both children with LI as well as their LT peers know and write the letters *O*, *A*, and *S*.

Results on the Write Name task were unexpected in light of previous findings. In the current study, no significant differences emerged on the Write Name task between children with LI and their LT, age-matched peers. In an earlier study, Cabell and colleagues (2009) found significant differences in name writing ability between 4-year-old children with and without language impairment. One possible explanation for these contradictory findings is the use of different scoring rubrics. The current study analyzed name writing using Puranik and Lonigan's (2009) 9-point rubric; while, Cabell and colleagues used a modified version of Lieberman's (1985) 16-point scoring rubric. When the name writing samples in the current study were rescored and analyzed using the same rubric as that used by Cabell and colleagues, significant group differences also emerged. Thus, it may be that the modified version of Lieberman's scale used by Cabell and colleagues is more sensitive to small changes in name writing ability, particularly for children who are writing pertinent letters when writing their names. Originally used in one of the most in-depth studies of name writing in preschool children (Lieberman, 1985), Lieberman's scale scores writing samples based on the number, order, and form of letters. For example, if children write their names including ordered, pertinent letters, with some letters

missing or added, they receive a score of 10; whereas, if children write their complete first names using conventional letters with the correct number of letters, but not in the correct order, they receive a score of 13. In contrast, Puranik and Lonigan's (2009) scoring rubric yields a score of 8 for both of these examples. In the current study, five of the children with LI received an overall score of 8 on the name writing task using Puranik and Lonigan's rubric. Those same children received scores of 13, 12, 10, 10, and 11 using the modified Lieberman scale. These results demonstrate that the particular scale used influences study outcomes.

Research on name writing in typically developing children demonstrates that name writing tends to be the most advanced emergent writing skill and that children use writing characteristic of earlier levels when asked to complete more difficult writing tasks (Bloodgood, 1999; Bus et al., 2001; Bus et al., 2005, Puranik & Lonigan, 2009). In the current study, children with LI also tended to produce a similar pattern. On the Write Name task, children with LI achieved a score of 1 on 60% of the criteria; whereas, on the Write CVC Words, Picture Description, and Sentence Retell tasks, they achieved scores of 1 on 31%, 31%, and 39%, of the criteria, respectively. Although statistical analyses comparing the differences between levels of name-writing and levels of word- or sentence-writing were not conducted, the results suggest that children with LI were able to write their names at a more advanced level than they were able to write other words or engage in composing tasks.

On the two composing tasks, picture description and sentence retell, no group differences emerged between the LI and LT age-matched groups, although the LT group performed better than the LI group. Most likely, the sample size of 11 per group was insufficient to produce group differences.

### Developmental Sequence of Writing Features

Similar to findings reported by Puranik and Lonigan (2009), results from the Guttman scaling procedure supported the conclusion that both LT children and children with LI follow the same developmental sequence in learning to write their names. This finding corresponds to the developmental pattern found for oral language in children with LI. There is substantial research to indicate that the pattern of oral language deficits exhibited by children with LI is best characterized as a profile of delay rather than deviance (Gleason & Ratner, 2009; Leonard, 1998). In other words, children with LI are most likely to demonstrate both late emergence and protracted development of oral language skills. Typically, they exhibit the same kinds of difficulties with oral language as younger, LT children, rather than exhibiting unusual or idiosyncratic oral language patterns that are evidenced infrequently or not evidenced at all in LT children (Gleason & Ratner, 2009; Leonard, 1998). Thus, it is important to note that the same developmental patterns exist in written as well as oral language for children with LI.

Although Puranik and Lonigan (2009) also found evidence of a developmental sequence for the composing tasks, similar results did not emerge for either of the LT groups in the current study. Once again, the small sample size ( $n=52$ ) of less than 100 respondents may have resulted in increased sampling error. For best results, Guttman (1950) recommends a minimum of 100 or more cases be used. In addition, many children in both groups produced only a single letter or a single simple character on the composing tasks, resulting in increased error scores and a possible floor effect for these tasks. The scoring rubric for the composing tasks was ordered as follows: (1) linearity, (2) segmentation, (3) presence of simple units, (4) left-to-right direction, (5) presence of complex characters, (6) random letters, (7) invented spelling. Children received

either a score of 1 if the feature was present or a score of 0 if the feature was absent. Thus, when children produced a single character, they received an error score for segmentation, because this feature requires the production of two characters to receive a score of 1.

### Age-Related Emergent Writing Differences

Results from regression analyses indicated that age was only a significant predictor of writing ability for the Write Letters and Write Name tasks. This finding compared favorably with results from Puranik and Lonigan's (2009) ANOVAs, which also found significant age-related differences between 4- and 5-year-old children on the Write Letters and Write Name tasks. Puranik and Lonigan also reported significant differences between the 4- and 5-year-old groups for Write CVC words. The small sample size of the current study may explain the failure to detect group differences and thus may account for the contradictory findings. Puranik and Lonigan included 201 4-year-old and 141 5-year old children in their participant sample, compared to 20 and 21, respectively, in the current study. Further, as discussed in Chapter 4 (pg. 126), the differences reported by Puranik and Lonigan resulted in an effect size of .41; whereas, this study obtained an effect size of .20. Thus, the smaller effect size also indicates a need for a larger sample to detect group differences.

## Relationships among Phonological Awareness, Alphabet Knowledge, and Emergent Writing

Consistent with other findings reported in the literature (Blaklock, 2004; Bloodgood, 1999; Burgess & Lonigan, 1998; Morris et al., 2003; Welsch et al., 2003), statistically significant, positive relationships occurred among name writing, alphabet knowledge, and phonological awareness for the LT children. Of particular interest to the current study are the relationships among AK, PA, and other emergent writing tasks. The current study is the first to consider relationships beyond name writing among emergent writing, AK, and PA. The following sections will discuss the relationships of PA and AK to each of the emergent writing tasks.

### Relationship of Phonological Awareness and Emergent Writing

The current study did not find significant relationships among any of the emergent writing tasks and PA. Previous research has revealed inconsistent findings relative to relationships between name writing and PA. For example, neither Bloodgood (1999) nor Welsch et al. (2003) found relationships between name writing and PA; whereas, Blair & Savage (2006) and Diamond et al. (2008) did. One possible explanation for these contradictory findings involves differences in the tasks used to measure PA. The current study as well as the studies conducted by Bloodgood (1999) and Welsch et al. (2003) used rhyming tasks to examine the relationship between name writing and PA. In the current study, children were asked to perform



three rhyming tasks: (1) to determine whether or not two words rhymed; (2) to identify the non-rhyming word from a set of three or four words; and, (3) to produce a word that rhymes when given a target. In the Bloodgood (1999) study, children were asked to complete a rhyme recognition task like the second task in the current study; while, in the Welsch et al. (2003) study, children were asked to complete a rhyme recognition task like the first task in the current study. Diamond (2008) and Blair & Savage (2006), on the other hand, used initial sound identification tasks to measure PA. It seems reasonable to suggest that PA skills in initial sound identification and name writing may be more closely related than PA skills in rhyming and name writing. Researchers have demonstrated that the first letter of children's first names provides the starting point for phonetic writing (Both-de Vries & Bus, 2008; Both-de Vries & Bus, 2010). In addition, initial consonant awareness is the earliest developing phonemic awareness skill (Morris et al., 2003). Therefore, the relationship between initial sound identification and sensitivity to the first letter of children's first names during name writing would seem to be a more likely one than the relationship between rhyme awareness and name writing.

### Relationship of Alphabet Knowledge and Letter Writing

Letter writing and AK showed significant, positive relationships in LT children, but not in children with LI. A possible explanation for these disparate findings could be attributed to the limited letter knowledge demonstrated by children with LI as compared to their age-matched, LT peers. On the Letter Knowledge subtest of the ALL, children with LI achieved an average scaled

score of 8.91; whereas, their age-matched LT peers achieved an average scaled score of 11.45. Morris et al. (2003) reported that AK underlies PA and serves as a precondition for the development of word recognition skills. Thus, it seems plausible that AK also underlies emergent writing and serves as a precondition for the development of letter writing ability. In this way, AK and letter writing would only share a positive relationship once children have sufficiently developed letter knowledge.

#### Relationship of Alphabet Knowledge and Name Writing

In the current study, a partial correlation with age in months partialled out revealed a statistically significant, positive relationship between AK and name writing. No statistically significant relationships were found between AK and name writing in any analyses conducted with only the 4-year-old, LT children; whereas, statistically significant positive relationships did emerge between AK and name writing in the 5-year-old children. These findings appear to be supported by Diamond et al. (2008), who noted significant bidirectional relationships between letter knowledge and name writing ability only for children who were writing letters. In the current study, 45% of the 4-year-old children with LI were unable to write any recognizable letters, and 30% of their age-matched, LT peers wrote five or more unrecognizable letters. In contrast, only 9% of the 5-year-old LT children wrote five or more unrecognizable letters. Thus, a relationship between AK and name writing may only exist for children who have advanced letter-writing skills.

## Relationship of Alphabet Knowledge and Word Writing

In examining the relationship of AK to word writing ability, results from both partial correlations revealed statistically significant, positive relationships. The LT children demonstrated advanced AK and word writing skills when compared to the children with LI, after controlling for age. Morris et al. (2003) demonstrated that AK forms the foundation for word recognition skills. Thus, one interpretation of the findings from the current study may be that children require advanced AK for both reading and writing words.

## Relationship of Alphabet Knowledge and Sentence Writing

The relationship of AK to the composing tasks is not clear. A significant positive relationship between AK and the Picture Description task was found when the scores from all of the LT 4- and 5-year-old children were analyzed with age in months partialled out, but no relationship was found between AK and the Sentence Retell task. Both 4- and 5-year-old LT children demonstrated more advanced skills on the Sentence Retell task, averaging 4.33 and 4.43 (out of a possible 7), respectively, than on the Picture Description task, averaging 4.13 and 3.60 (out of a possible 7), respectively; however, there were no significant differences in performance between the groups. Similarly, Puranik and Lonigan (2009) did not find any age-related differences on the composing tasks. It appears that both children in the current study as well as children in Puranik and Lonigan's study had difficulty with the composing tasks. One possible

explanation for the current study's contradictory findings could be task differences. The Sentence Retell task is structured; it requires children to write a specific sentence from dictation. The Picture Description task, on the other hand, is unstructured; it requires children to create what they want to write. Thus, it may be easier for children to write when the composing task provides them with more rather than less structure.

### Relationship of Oral Language to Phonological Awareness, Alphabet Knowledge, and Emergent Writing

Results from the current study revealed no significant relationships among oral language and AK, PA, or any of the emergent writing tasks for children with LI, which is consistent with other research findings. Cabell and colleagues (2009) conducted the only other study to examine the relationship of oral language to AK, PA, and name writing, and did not find any significant relationships.

The partial correlation with age in months partialled out revealed a statistically significant, positive relationship between oral language and PA for LT children ( $r=.516$ ), which is consistent with other research findings (Blair & Savage, 2006; Burgess & Lonigan, 1998). For example, Burgess and Lonigan (1998) reported a statistically significant, positive relationship between grammatical abilities (i.e., both expressive and receptive) and a rhyme oddity task ( $r=.37$ ).

In the current study, no significant relationships between oral language and AK for LT children were found. Previous research examining the relationships between oral language and

AK has reported inconsistent findings (Blair & Savage, 2006; Burgess & Lonigan, 1998; Cabell, et al., 2009). Cabell and colleagues (2009) and Blair and Savage (2006) did not find significant relationships between oral language and AK; whereas, Burgess and Lonigan (1998) did. One reason for the discrepant findings may be the oral language measure used in each of the studies. Both Cabell and colleagues and Blair and Savage included measures of receptive vocabulary. In contrast, Burgess and Lonigan included only measures of grammatical understanding and production. The current study used the Language Index score of the ALL, which includes both a measure of receptive vocabulary and a measure of grammatical production. Additionally, the NELP (2008) reported that grammatical measures had a stronger relationship ( $r=.47$ ; 95% CI = .43 –.50) for predicting decoding outcomes than did receptive vocabulary measures ( $r=.34$ ; 95% CI: .31–.37). Taken together, the research supports the conclusion that measures of grammatical understanding and use are more closely related to AK than measures of receptive vocabulary.

This study is the first to go beyond name writing in examining the relationships among oral language and emergent writing. Results revealed significant, positive relationships between oral language and letter, word, and sentence writing for the LT children. These results are consistent with emergent literacy theory, which argues that speaking, listening, reading, and writing are interrelated skills (Teale & Sulzby, 1986).

## Conclusions

Two important conclusions emerge from the findings of this study. First, the same developmental patterns exist in written as well as oral language for children with LI. Similar to the research indicating that the pattern of oral language deficits exhibited by children with LI is best characterized as a profile of delay rather than deviance (Gleason & Ratner, 2009; Leonard, 1998), the results from this study support the conclusion that both LT children and children with LI follow the same developmental sequence in learning to write their names. Although statistically significant differences between children with LI and LT children were not found for all of the emergent writing tasks, the children with LI scored more poorly on all emergent writing tasks. It seems quite plausible that increased numbers in the study sample will allow for the detection of additional group differences.

Second, the differing results on the Write Name task obtained in this study using different scoring rubrics highlights the need to use a scoring rubric that is sensitive to small changes in name writing ability, particularly for children who are writing pertinent letters when writing their names. Puranik and Lonigan (2009) argued that different scoring criteria among studies make it difficult to compare results across studies, and the results of this study underscore their argument.

### Limitations

This study was limited by several factors. First, the small sample size and low power made finding significant group differences difficult. It seems quite possible that group differences between children with LI and their age-matched, LT peers on the Write Name task as well as differences between LT 4-and -5-year-old children on the Write CVC words task are present, but were undetected in the present study.

Second, this study did not account for differences in previous instruction among the children. By requiring that mothers of study participants have at least a high school or equivalent education, an attempt was made to ensure that all children experienced literacy-rich home environments; however, no attempt was made to equate the quality of their preschool experience.

Third, this study did not use the same pictures for the Sentence Retell task as Puranik and Lonigan (2009) as these pictures were not available to the author. Thus, caution must be applied when comparing results from the two studies, since the stimuli differed across the studies.

Finally, it is conceivable that different scoring decisions were made in the current study and in that of Puranik and Lonigan (2009), when scoring the Write Name and composing tasks. Prior to conducting the current study, the author studied the scoring examples in Puranik and Lonigan's appendix and communicated with Puranik (personal communication, 2010) about the scoring procedures of these two sections. Nevertheless, one scoring example in the earlier study indicated possible differences in scoring relative to the feature of "random letters". Children in the current study received a score of 0 on the "random letters" feature, when they produced either words spelled correctly or words spelled using invented spelling. Children received a score of 1 for "random letters", when they produced letters that were not pertinent to the specific

task. In Puranik and Lonigan's study, a score of 1 was assigned for "random letters" on the following example: "She is mace the bed". In the current study, that example would have received a score of 0 for "random letters". Thus, it seems possible that differences in scoring decisions could account for differences in the study outcomes. In the end, no evidence of a developmental sequence for writing features on the composing tasks emerged. The decision to assign a score of 0 to "random letters" for samples using either correct or invented spelling may have increased the error score, thereby lowering the  $C_R$ . In contrast, if a score of 1 had been assigned to "random letters" for samples using correct or invented spelling, the resultant error score would have been lower, thereby increasing the  $C_R$ . This latter decision, however, did not seem justified. Even in the example provided by Puranik and Lonigan (2009), the child could easily have been assigning the "hard c" pronunciation to the letter "c" in the word "mace" as is observed in the words "can", "cup", and "comb". Thus, using the letter "c" in the word "mace" for the sentence "She is mace the bed" does not appear to be random.

### Implications for Speech-Language Pathologists (SLPs)

This study has several implications for SLPs. When situated within the larger context of evidence-based practice, the differing results obtained from the two name-writing rubrics highlights the importance of using criterion-referenced measures that yield an accurate description of the specific knowledge and skills students demonstrate (Linn & Gronlund, 2000). In order to plan and implement effective language therapy, SLPs need to ensure they are using



assessments that yield information that is directly relevant to learning outcomes (Linn & Gronlund, 2000).

Second, the difficulties with emergent writing experienced by children with LI in this study suggest that emergent writing tasks, particularly letter writing, should be considered as part of a comprehensive therapeutic approach for preschool children with language deficits. Research has consistently demonstrated that emergent writing is predictive of later literacy outcomes (NELP, 2008), and the updated roles and responsibilities of SLPs outlined by the American Speech- Language -Hearing Association (ASHA) task force charge clinicians with the inclusion of both language and literacy skills when providing services to preschool students (ASHA, 2010). The results of the current study, as well as those of Cabell, et al., (2009) suggest that emergent writing tasks may be important components of language therapy with young children since they set the stage for later reading achievement. In addition, the results of the current study may assist clinicians in sequencing the order of therapy tasks. Results indicated that advanced AK was needed for success with the emergent literacy tasks; therefore, clinicians may want to consider introducing AK tasks before introducing emergent writing tasks. Once children have more advanced AK, introducing emergent writing tasks by beginning with letters and moving to children's names and then simple CVC words may be the most effective use of therapy time.

The relationship of advanced AK to emergent literacy tasks also has additional implications for instruction of emergent writing. Research on the development of AK demonstrates that uppercase knowledge develops before lowercase knowledge. In addition, the largest percentage of children know the uppercase letters *A, O, X* as well as the uppercase letters in their first names. Further, uppercase letter knowledge appears to drive the acquisition of

lowercase letter knowledge (Justice, et al., 2006; Mason, 1980; Smythe, et al., 1971; Turnbull, et al., 2010; Worden & Boettcher, 1990). Thus, children tend to learn first those lowercase letters for which they already have an uppercase equivalent. In addition, the largest percentage of children know the lowercase letters *o*, *s*, and *x*. It may be appropriate, then, for clinicians to follow similar patterns when sequencing emergent writing tasks in therapy by first introducing uppercase letters, specifically, *A*, *O*, *X*, as well as the first letter of the child's name. When introducing lowercase letters, it may be more effective to begin with the letters *o*, *s*, and *x* as well as the uppercase letters already known by the child.

Finally, the relationship of emergent writing to some phonological awareness tasks (e.g., initial sound awareness) but not others (e.g. rhyme awareness) may help guide intervention decisions. A more effective, efficient intervention approach may be to combine emergent writing tasks with initial sound awareness tasks, rather than rhyme awareness tasks. Further, research has demonstrated that PA instruction is more effective when combined with AK (National Institute of Child Health and Human Development, 2000). When considered in light of the current findings, the most effective, efficient instruction may entail an integrated approach that combines initial sound awareness tasks with AK and emergent writing tasks.

### Future Research Directions

This study is exploratory in nature. It is the first study to extend an examination of emergent writing skills beyond name writing in children with LI. Results suggest several future research directions.

The significant differences between children with LI and their LT age- matched peers on the Write Letters and Write CVC Words tasks are encouraging, especially considering the small sample sizes. On the composing tasks, group differences were noted, although the differences were not statistically significant. Given the low power of the composing tasks combined with significant group differences on the other writing tasks, it seems reasonable to conduct additional studies using larger sample sizes. In addition, this study only included 4-year-old children with LI. Future studies need to include preschool children with LI across a broader age range.

An interesting finding is the difference in results on the Write Name task when using different scoring rubrics. Determining the most sensitive measure to document changes in emergent writing abilities is necessary not only to allow for more cogent comparisons and generalizations across research studies but also to permit for more in-depth understanding of a particular child's abilities. Therefore, a study to identify the most sensitive emergent writing scoring rubric seems warranted.

Finally, although research clearly demonstrates the importance of PA and emergent writing to later literacy outcomes (NELP, 2008), the relationships between PA and emergent writing are still not well understood. Both Blair and Savage (2006) and Diamond et al. (2008) reported that phonological awareness was a strong predictor of name writing ability; whereas, Bloodgood (1999) and Welsch et al. (2003) did not find significant relationships between

phonological awareness and name writing ability. As discussed earlier, it may be that some PA tasks (e.g., initial sound identification) are related to emergent writing; whereas, other PA tasks (e.g., rhyme awareness) are not. Understanding the relationship between PA and emergent writing may have important instructional implications. In order to fully examine the relationships between PA and emergent writing, a larger study that includes a variety of both PA tasks and emergent writing tasks is suggested

## APPENDIX A: IRB APPROVAL LETTER



University of Central Florida Institutional Review Board  
Office of Research & Commercialization  
12201 Research Parkway, Suite 501  
Orlando, Florida 32826-3246  
Telephone: 407-823-2901 or 407-882-2276  
[www.research.ucf.edu/compliance/irb.html](http://www.research.ucf.edu/compliance/irb.html)

### Approval of Human Research

From: **UCF Institutional Review Board #1  
FWA00000351, IRB00001138**

To: **Stacey Pavelko**

Date: **November 30, 2010**

Dear Researcher:

On November 30, 2010, the IRB approved the following human participant research until 11/29/2011 inclusive:

Type of Review: UCF Initial Review Submission Form  
Project Title: Emergent Writing Skills in Preschool Students with Language Impairment  
Investigator: Stacey Pavelko  
IRB Number: SBE-10-07252  
Funding Agency: None

The Continuing Review Application must be submitted 30 days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form cannot be used to extend the approval period of a study. All forms may be completed and submitted online at <https://iris.research.ucf.edu>.

If continuing review approval is not granted before the expiration date of November 29, 2011, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a signed and dated copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Joseph Bielitzki, DVM, UCF IRB Chair, this letter is signed by:

Signature applied by Janice Turchin on 11/30/2010 02:19:50 PM EST

IRB Coordinator

## APPENDIX B: PARENT QUESTIONNAIRE

## PARENT QUESTIONNAIRE

### GENERAL INFORMATION:

Child's Name: \_\_\_\_\_ DOB: \_\_\_\_\_

Address: \_\_\_\_\_

Home phone: \_\_\_\_\_

Does your child live: \_\_\_\_\_ with mother \_\_\_\_\_ with father \_\_\_\_\_ with both  
\_\_\_\_\_ with grandparents \_\_\_\_\_ with foster care \_\_\_\_\_ with siblings

Mother's Name: \_\_\_\_\_ Age: \_\_\_\_\_

Mother's Occupation: \_\_\_\_\_ Phone: \_\_\_\_\_

Mother's Highest Level of Education Completed: \_\_\_\_\_ High School or GED  
\_\_\_\_\_ Technical School \_\_\_\_\_ Some College \_\_\_\_\_ Bachelor's Degree  
\_\_\_\_\_ Master's Degree \_\_\_\_\_ Did not complete High School

Father's Name: \_\_\_\_\_ Age: \_\_\_\_\_

Father's Occupation: \_\_\_\_\_ Phone: \_\_\_\_\_

Father's Highest Level of Education Completed: \_\_\_\_\_ High School or GED  
\_\_\_\_\_ Technical School \_\_\_\_\_ Some College \_\_\_\_\_ Bachelor's Degree  
\_\_\_\_\_ Master's Degree \_\_\_\_\_ Did not complete High School

Child's School/Daycare: \_\_\_\_\_ Phone: \_\_\_\_\_

Teacher's Name: \_\_\_\_\_ Director's Name: \_\_\_\_\_

Siblings: \_\_\_\_\_



2

What languages does your child speak? What is your child's primary language?

What languages are spoken in the home? What is the primary language spoken?

With whom does your child spend most of his/her time?

Has your child ever been seen by a speech-language pathologist? Who and when? What were the conclusions or suggestions?

Have any other specialists (physicians, psychologists, special education teachers, etc.) seen your child? If yes, indicate the type of specialist, when your child was seen, and the specialist's conclusions or suggestions.

**PRENATAL & BIRTH HISTORY:**

Mother's general health during pregnancy (illnesses, accidents, medications, etc.)

Length of pregnancy: \_\_\_\_\_ Length of labor: \_\_\_\_\_

General condition: \_\_\_\_\_ Birth weight: \_\_\_\_\_

Apgar scores: \_\_\_\_\_

Type of delivery:    head first    feet first    breech    Caesarian

Were there any unusual conditions that may have affected the pregnancy or birth?

3  
DEVELOPMENTAL HISTORY

Provide the approximate age at which your child began to do the following activities;

Crawl \_\_\_\_\_ Sit \_\_\_\_\_ Stand \_\_\_\_\_  
Walk \_\_\_\_\_ Feed Self \_\_\_\_\_ Dress Self \_\_\_\_\_  
Use toilet \_\_\_\_\_ Babble \_\_\_\_\_ Use single words \_\_\_\_\_  
Combine words \_\_\_\_\_ Name simple objects \_\_\_\_\_  
Use simple questions \_\_\_\_\_ Engage in conversation \_\_\_\_\_

Does your child have difficulty walking, running, or participating in other activities that require small or large muscle coordination?

Are there or have there ever been any feeding problems (sucking, swallowing, drooling, chewing)? If yes, please describe.

Describe your child's response to sound (responds to all sounds, responds to loud sounds only, inconsistently responds to sounds, etc.).

Person completing the form: \_\_\_\_\_

Relationship to the child: \_\_\_\_\_

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

## APPENDIX C: WRITING SAMPLE PROTOCOL

## Writing Protocol

For each task, give the child a new piece of paper. Make sure to write the child's number on the back of the paper, as well as the task number. This may be done in advance, but make sure the child doesn't see it.

Introduce the writing tasks by saying, "Now, I am going to have you do some writing."

Be encouraging with the children. If a child tells you that he/she can't write, respond with "well pretend that you can write. Show me how you pretend to write" Encourage any marks the child makes on the paper.

### 1. Write Letters

Name each letter and ask the child to write it.

"I'm going to have you write some letters"

"Write the letter \_\_\_\_\_"

B

D

S

T

O

A

H

K

M

C

### 2. Write Name

Ask the child to write his/her name

"Show me how you write your name"

### 3. Write CVC Words

Ask the child to write each of the following words

"Now, I'm going to say some words and I want you to write them"

"Write the word \_\_\_\_\_"

Mat

Bed

Duck

Cat

Fell

Hen

#### 4. Picture Description

“Now, I’m going to have you write about some pictures”

Show the child the first picture and say, “Write a sentence about this picture”.

Repeat for the second picture.

#### 5. Sentence Retell

“Now I’m going to say a sentence and I want you to say what I say”.

“Say: She is making the bed”.

“Now, I want you to write that”

“Say: The boy is wearing a red cap”.

“Now write that”

## APPENDIX D: MODIFIED LIEBERMAN (1985) SCORING RUBRIC

Score	Description of Transition
1.	No distinction between drawing and writing, with scribbling intertwined with picture.
2.	No distinction between drawing and writing, with some discrete letter-like graphemes intertwined with picture
3.	Distinction between drawing and writing
4.	Continuous zigzag scribble
5.	Continuous zigzag scribble with the beginnings of distinct graphemes.
6.	Discrete, letter-like symbols
7.	Approximately one to three symbols, with at least one pertinent, recognizable letter present.
8.	A string of letters (approximately 4 or more) with pertinent letters and/or placeholders (may be letter-like forms). The number of symbols does not equal the number of letters in the child's name
9.	A string of unordered pertinent letters. Some letters may be omitted or added. No placeholders are present
10.	A string of ordered pertinent letters. Some letters may be omitted or added. No placeholders are present.
11.	A string of pertinent letters and placeholders equal to the number of letters in the child's name.
12.	Complete ordered name is written using recognizable but not conventional letters
13.	Complete name is written using conventional letters, but letters are unordered
14.	Complete name is written using conventional letters in a correct order.

*Note.* Adapted from Cabell, et al., (2009), with permission.

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