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Alphabetic and phonemic awareness in toddlers

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"Oh, magic hour, when a child first knows she can read printed words!"

— Betty Smith, *A Tree Grows in Brooklyn*

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ABSTRACT

The ability of 20-24 month-old toddlers to recognize graphemes and phonemes was investigated by reading a *Phonic Faces* (PF) alphabet picture book. Phonic Faces iconically picture a letter in the mouth of a character producing the sound (the curve of the P looks like the top lip popping the /p/ sound). The book was composed of nine letters and was read individually to experimental subjects three times weekly for six weeks. The control group received no treatment, but engaged in individual play activities for comparable time. Following six-weeks the groups alternated so the former control group now received the alphabet book reading treatment and vice versa. Parents also completed a Home Literacy Questionnaire.

Subjects were assessed using seven experimenter-designed measures. Three of the measures assessed letter awareness and discrimination skills and four comparable measures assessed phonemic knowledge as well as phoneme production in response to a letter. The tasks examined the ability to point to a letter or phoneme in the context of a PF card, to discriminate between three letters or phonemes represented by PF cards, to discriminate between two letters and one number, and to produce the correct phoneme when shown the letter within a PF card.

Analyses across pre- and post-assessments showed that children were able to identify letters and phonemes following repeated exposure within the context of alphabet book reading and the picture support provided by the PF. Differences between the two groups were significant for both phases of the study, supporting the hypotheses that toddlers can learn letters and phonemes mediated through the context of alphabet book reading using the iconic faces. Particular gains were made in the areas of letter

identification, letter discrimination with PF, and sound production. Overall gains were maintained after a six-week period without intervention. Additionally, there was a direct correlation between overall development of letter and phoneme awareness and direct literacy experiences at home as determined by the Home Literacy Questionnaire. These results call into question the current view that alphabet knowledge is a secondary language skill that is learned through explicit instruction rather than a language acquisition process.

REVIEW OF LITERATURE

Emergent literacy has become the focus of much discussion and research in recent years. Most of the experimental research has been in the area of phonological awareness, with other areas of emergent literacy, such as print awareness, storybook reading, parent-child interaction, and story grammar being studied most often in a descriptive, ethnographic, and/or case study format (Gunn, B.L., Simmons, D. C., & Kameenui, E. J., 1995). However, the vast majority of the current literature on emergent literacy focuses on preschool and kindergarten aged children. A literature search elicited no studies assessing pre-reading skills specific to print and phonemes in infants and toddlers. This experimental study is a first step toward filling that void.

Emergent literacy has received a great deal of attention in the past few decades as speech language pathologists, educators, psychologists, and other pediatric professionals have realized the importance of early exposure to books and written language prior to formal education in kindergarten. Gunn et al. (1995) reviewed the extant literature and defined emergent literacy as learning about reading, writing, and print prior to formal reading instruction in school through casual and adult-directed activities, primarily in the home. They described emergent literacy as being composed of literacy experiences such as storybook reading, context (home and community), and cultural practices and literacy knowledge, including letter knowledge, phonological awareness, understanding of text structures, print-speech relationship recognition, and print awareness. For the purposes of this paper, emergent literacy will be defined according to Whitehurst and Lonigan's description that "the acquisition of literacy is best conceptualized on a developmental continuum, with its origins early in the life of a child, rather than the all-or-none phenomenon that begins when children start school" (1998, p.848).

Whitehurst and Lonigan (1998) distinguish between emergent literacy and "reading readiness," with reading readiness referring to a group of skills needed prior to formal reading instruction. In contrast, emergent literacy operates under the assumption that oral and written language are developing simultaneously and with mutual influence upon each other from the time of infancy until formal reading instruction begins in kindergarten. Components of emergent literacy include storybook reading, print concepts, alphabetic knowledge, phonological awareness, pretend reading and writing, environmental print, and oral language.

Emergent literacy begins in the home environment through exposure to written words on television, video and computer games, toys, coupons, recipes, board games, playing cards, and reading materials such as books, magazines, newspapers, and mail (Bus & van Ijzendoorn, 1988; Marsh, 2003). Art tools and writing implements, such as chalk and chalkboard, crayons, paint, pencils, markers, and paper also provide children with avenues to experiment with literacy in the forms of writing and drawing (Lawhon & Cobb, 2002). In addition to the home, children are exposed to print through other environments via street signs, billboards, maps, posters, and signage in stores and throughout the community (Marsh, 2003). Although exposure to literary experiences and print in the home and community are important, the interactions that occur with those materials through the mediation of oral language are crucial to emergent literacy development.

Emergent Literacy in Infants

The first experiences with print and pre-reading activities typically occur in the home within parent-child interactions. Early exposures to letters and print happen through television (particularly children's programming), picture books, and other book reading

(Bus & van Ijzendoorn, 1988) as well as through language play in the form of songs and nursery rhymes. Shared picture book reading is a primary feature of emergent literacy because it teaches young children about picture and symbol representation, and exposes them to print and print concepts such as directionality in a decontextualized format (Bus & van Ijzendoorn, 1988, 1997; Lawhon & Cobb, 2002; Senechal, Cornell, & Broda, 1995). In their study of infants' and preschoolers' emergent literacy experiences, Bus and van Ijzendoorn (1988) found that most mothers indicated they did not give reading instruction to their children during shared storybook activities. However, the results demonstrated that the mothers were naming and talking about letters and drawing connections between oral words and their alphabetic representation without realizing it. Mothers tended to follow the child's lead if the child showed some interest in letters and reading. Their research also showed that mothers provided more spontaneous reading instruction with picture books and letter books than with a children's television program that focused on reading. They hypothesized that this may have been due to the rapid presentation speed on the television show that allowed little time for comment and discussion between mother and child. Bus and van Ijzendoorn (1988) concluded that although early reading occurs in a natural environment that it is not necessarily a natural process. Instead, early reading tends to be a casual teaching experience that is child-led.

In their 1997 study of mother-infant dyad interaction during storybook reading, Bus and van Ijzendoorn scored the infants' behaviors on six different parameters. These included acting upon the book (banging, touching, grabbing, random pointing), page turning and opening/closing the book, verbal and nonverbal referencing (petting an animal or making an animal noise), looking, pointing, or gesturing in response to mothers' questions and comments, attention to the book aside from response (visual

attention directed at the pages of the book), and staying still during the reading experience. Bus and van Ijzendoorn (1997) found that there was a noticeable change in the way that infants began to interact with books early in their second year. The touching, reaching, and even eating behaviors of the 12-13 months old children changed to more referential behaviors such as attending to pictures, making sounds and gestures in response to pictures, and responding more to comments and questions by their mothers when they were 13-14 months old. The data suggested that children develop a growing understanding of books as referential and begin to understand the pictures as proto-symbols. This was evidenced by the manner in which the children would gesture, act upon, or vocalize appropriately in response to pictures within the reading tasks. Mothers contributed to this behavior with their comments and questions.

In another study of parent-child interactions during storybook reading, Senechal et al. (1995) found that the age of the child had a definite effect of the type of interactions within the dyad. Parent-child dyads with children ages 9-months-, 17-months-, and 27-months-old were observed and evaluated during picture book reading activities with a parent, typically the mother. Picture books with and without text were used. They found significant increases in the amount of parent questioning and the number of children's vocalizations as the ages of the children increased. Across all age groups, parents consistently responded to a child's gaze on a page with a point to that page within approximately one second Parents were very sensitive and perceptive in their interaction with their children. They used pointing to follow and maintain a child's attention to a particular page or picture. The researchers also found that the older children consistently looked at pages longer. The 9-month-olds, 17-month-olds, and 27-month-olds attended to the books 55%, 73%, and 88% of the duration of the reading episode, respectively.

Senechal et al. (1995) found that the age of 17-months seemed to be a pivotal time of change in the structure of the picture-book reading experiences. Parents of the 9-month-olds relied largely on attention-recruiting comments (e.g., "Look at this!") and elaborations (e.g., "That's her favorite toy.") and the parents of the 27-month olds used more questions (e.g., "What's that?") and feedback (e.g., "Yes, that's right."). However, at the age of 17-months, the parents used all four behaviors frequently to both attract the attention of the infants and then encourage the infants to respond as well. Children who were encouraged to respond through questions and feedback vocalized more than children who were not asked questions. Obviously, storybook is a key component in early literacy experiences, but are young infants capable of more than attending and pointing to pictures and recognizing pictures as proto-symbols?

Clearly, storybooks are a key component in early literacy experiences with regard to interpreting picture symbols and associating oral language with pictured objects and events. But to date this research has not explored whether infants can also learn about the alphabetic symbols represented by the print in storybooks. However, evidence from home and preschool environments do reveal that children have early experiences with environmental print as well as alphabet books that more directly focus on print.

Alphabet Book Reading

Book genres for toddlers primarily include simple narratives about familiar routines and experiences, nursery rhymes, vocabulary books (e.g., books about categories such as animals or body parts with one label and picture per page), and alphabet books. Parents' reading behaviors and children's responses may vary considerably depending on the type of book that the parent-child dyad reads during a shared book experience (Bus & van Ijzendoorn, 1988; Justice, Weber, Ezell, & Bakeman, 2001; Stadler & McEvoy,

2003). Specifically, it could be hypothesized that alphabet books would naturally increase parents' print-referencing comments in general and comments about letters in particular.

Stadler and McEvoy (2003) assessed the effect of alphabet books as compared to narratives during shared book experiences with a group 72 parent-child dyads. Fifty-five of the children were typically developing and 17 had known language impairments, with all children ranging from 54-66 months of age. Each parent was instructed to look at and read a storybook and an alphabet-rhyming book to their child as they would do at home. Reading sessions were videotaped and analyzed on the basis of content and form. For the purposes of this study, content referred to comments about the story or characters in the book as well of the child's personal experiences that related to the book. Form was noted to be any parental comments that referred to phonological awareness, print awareness, or book concepts.

Results from Stadler and McEvoy's study (2003) indicated that parents utilized more content-related comments with the storybooks and more form-based comments when reading the alphabet books, particularly print awareness and phonological awareness. Comments about book concepts such as author, page, title, etc. were not significantly impacted by either genre of book. Interestingly, parents also spent more time reading the alphabet books (mean of 10.62 minutes) than they did the narratives (mean of 5.54 minutes). Not only did the parents spent more time reading the alphabet books, but they also talked about content with the alphabet book almost as frequently as they did with the storybook, although there was no narrative component to the alphabet book. The alphabet-rhyming book elicited both content and form contents. Naturally, the predominance of the alphabet letters leads to some discussion about letter names, letter

sounds, and letter shapes, but parents also frequently included comments about the objects and actions despite the lack of a story in the alphabet book.

Another result of Stadler and McEvoy's (2003) study was the finding that the parents of the children with language impairments (LI) used fewer phonological awareness comments and prompts than did the parents of the typically developing children. They felt that this may have been due to several possible factors such as, the children with LI recognizing fewer alphabet letters, the parents focusing on teaching vocabulary to the detriment of focusing on form, and the effect of the child's questions, or lack thereof, which influenced the dyadic relationship. The authors also suggested that parents of children with LI may intuitively focus on meaning before form.

In another study, van Kleeck (1998) followed 14 mother-child storybook-reading dyads when the children were two, three, and four years of age, and results were similar to those of the Stadler and McEvoy (2003) study. Mothers were asked to read a storybook, a rhyming book, and an alphabet book to their preschoolers during each phase of the study. Van Kleeck reported that there was a strong emphasis on meaning or content over form prior to two years of age, even with the alphabet books. However as the children reached the ages of three- and four-years-old, there was a noticeable shift to increased comments and emphasis on the form elements of the alphabet books, in particular letter names, letter sounds, and letter shapes. Print concepts were not addressed at any age with the storybooks and rhyming books, but there was a consistent increase in print-referencing with the alphabet books from less than 25% of maternal utterances that emphasized form at two years to greater than 50% of maternal utterances focusing on form at both three and four years of age. In fact, form utterances surpassed content utterances when the children were between three and four years of age.

Van Kleeck (1998) noted that when their children were younger than three-years-old, the mothers tended to treat the alphabet books as if they were typical storybooks and focused on content and descriptions rather than print concepts. Mothers were demonstrating that print is meaningful and helping the child develop the basic orthographic notion that it is words that are read and not pictures, but were not specifically talking about the letters. However, the shift with the preschooler-mother dyads appeared to be that the mothers were intentionally teaching their children about letters, including their appearance, their names, and the sounds associated with them. Van Kleeck suggested that this may have been the result of the mothers thinking ahead to preschool and kindergarten demands and/or the children's growing interest in and awareness of letters and words. She stated that most mothers gave developing a love of books as a primary reason that they read to children. However, she found that as children approached the kindergarten age that there was a deliberate increase in talking and teaching about form and not solely meaning during shared book experiences. This notion is incorporated into van Kleeck's notion of two stages of early literacy with the first stage of preliteracy development focusing on meaning and the second stage focusing more on print form.

Although not an experiment focusing specifically on alphabet books, Justice et al. (2001) found some compelling evidence for increasing parents' print-referencing behaviors during storybook reading. Their study utilized a book that typically contained eight to ten words on a page with one or two words embedded into the illustration on the page. Even though individual alphabet letters were not the premise of the book, print was highlighted in obvious and highly contextualized ways throughout the story.

Fifteen parent-child dyads, with typically developing preschool children ages 50-54 months old, participated in the study. All of the parents were trained to read the same book with an emphasis on print-referencing behaviors, specifically, questions, comments, and requests about print. All reading sessions were videotaped and both the parents' and the children's responses were coded and analyzed. The parents' responses were initially coded as Print Reference (noting alphabet letters, punctuation, or using print-referencing words such as "letter, print, spell") or other (such as comments about the story or pictures). The Print Reference comments were further coded as being either a prompt or comment. Prompts were defined as parental statements or questions about print that obligated the child to respond, whereas Comments were noted to have a low or no demand for the child to respond. Finally, each print-referencing prompt was coded into one of six topics, including book-reading concepts (BRC—directionality, book elements), word awareness (WA—features of words), alphabet knowledge (AK—naming and identifying letters), phonemic awareness (PA—manipulating sounds in a word), grapheme-phoneme correspondence (GP—sound-symbol relationships), and word reading (WR—reading, finding, identifying a word or phrase). The children's responses during the book-reading interactions were coded as verbal, nonverbal, verbal and nonverbal, no response, or irrelevant.

Justice et al. (2001) found that the children in the study responded to parents' verbal print references approximately 60% of the time, with more responses following prompts rather than comments. However, there were no significant differences among responses to the six specific topics such as word awareness, book-reading concepts, and others. In fact, the probability that children would respond to the lowest skill category of book-reading concepts was .87 versus the highest skill category of word reading with a

probability of .82. The researchers proposed that this homogeneity of responses may be due simply to the motivational power of parental prompts in a relational book-reading activity. Theoretically, the implications of this study support the Vygotskian concept of the Zone of Proximal Development (Vygotsky, 1978, 1986). Preschool aged children with no formal reading instruction were able to participate in some word-reading tasks (e.g., "Do you see the word *bear* again?") with the socially mediated assistance of parental print-referencing. These scaffolding behaviors occurred within the context of the familiar activity of shared book-reading and led to the children's responses through intentional parental prompts. The implications for use of these similar print-referencing behaviors during the reading of alphabet books are numerous, particularly as means of ascertaining if children younger than four-years of age can also tap into higher level reading skills than would also be expected.

Home and School Literacy Environments

A literate home environment begins with the presence of easily accessible reading and writing materials in the home. However, the literacy environment in the home is not merely formed by the presence of literary "tools," but it is also shaped by the child's experiences with print materials, family attitudes about literacy, and adult modeling of reading and writing activities (Bus & van Ijzendoorn, 1988; Senechal, LeFevre, Thomas, & Daley, 1998; Lawhon & Cobb, 2002; Roberts, Jurgen, & Burchinal, 2005). Activities that develop an awareness of rhyme, prosody, and rhythm such as nursery rhymes, songs, and fingerplays help build a foundation for reading as well (Lawhon & Cobb, 2002).

In her study of home and preschool literacy environments, Marsh (2003) found that preschool reading and writing activities were frequently carried over into the home, but literacy experiences begun in the home were rarely reinforced in the preschool

setting. A discontinuity between home and school literacy experiences results in different activities, books, concepts, vocabulary, and syntax occurring in each environment with no cohesion or reinforcement. Of particular note, Marsh (2003) found that in her sample of three- and four-year-olds from a white working-class community in England that many of the books in the children's homes were fairy tales, Disney books, and other reading materials generally related to popular children's culture (e.g., Bob the Builder, Dora the Explorer). Not only were many of the books based on popular culture, but the print, logos, and pictures associated with the stories also appeared on toys, clothes, and food items throughout the home. In their home literacy environments these children were saturated with print and story constructs that were not addressed or reinforced in the context of preschool.

Upon parent interview about the types of book and reading experiences at home and school, most of the mothers who were interviewed reported that their children came home re-enacting activities and concepts from school. This type of school-to-home carryover was encouraged by the parents, but the reverse infiltration of knowledge from home to school rarely occurred and was not initiated by the teachers. Of note, formal print instruction, both reading and writing, were also more directly emphasized at home as the result of school exposure.

However, the problem with this school and home dichotomy was addressed by *Curriculum Guidance*, as cited in Marsh (2003):

> Young children's learning is not compartmentalized. They learn when they make connections between experiences and ideas that are related to any aspect of their life in the setting, at home and in the community…Children's surroundings offer natural

> opportunities to look at and learn about printed language, such as food packets, road signs and labels. (p. 372)

The literacy experiences that were most natural and common to a child at home, such as recipes, newspapers, games, toys, and TV-based books were typically the least likely to be included in the print interactions at preschool (Marsh, 2003).

On the other hand, it has been noted that having a preschool classroom replicate some aspects of home literacy experiences through pretend play "centers" such as home living, grocery store, or office, can offer supplemental literacy support and print awareness and bridge the gap between home and school reading exposure (Whitehurst & Lonigan, 1998; Lawhon & Cobb, 2002; Marsh, 2003). A study by Neuman and Roskos (1993) found that children in Head Start classrooms equipped with an office play center containing functional print, like calendars and phone books, as well as writing materials, scored higher than control classrooms on environmental print tasks (as cited in Whitehurst & Lonigan, 1998, p. 860). When a trained adult volunteer who modeled and scaffolded the children's play, such as taking an order, was added to the classroom the children performed even higher on environmental print tasks than the rooms with office centers and no adult volunteer. These types of creative learning experience can foster cohesion between the home and preschool literacy environments.

In addition to providing books and environmental print in the home and creating play-based literacy experiences, familial attitudes about literacy and the mother-child attachment contribute to a child's emergent literacy. Bus and van Ijzendoorn (1988) conducted a study in which toddler and preschool-aged children and their mothers participated in three literacy activities including watching brief *Sesame Street* clips about

letters and words, reading a picture book with flaps and only one word per page, and reading an alphabet book together. Mother-child attachment in the youngest group (18-month-olds) was also studied using the Strange Situation procedure which consisted of the mother leaving and returning twice. The dyads were categorized as anxiously avoidant attachment, secure attachment, or anxiously resistant attachment. A security scale was also used to judge the reunion with the interactions scored as the child resisting the mother or being ambivalent upon her return, the child being distressed or indifferent at first but readily accepting mother's offer to play, or the child greeting or hugging the mother.

Bus and van Ijzendoorn hypothesized that mother-child dyads with higher degrees of security and appropriate attachment would have a more pleasant relationship that would result in more shared book experiences, less disciplining during reading, and more reading instruction. Indeed, the results indicated that the secure children were more attentive during the literacy activities and engaged in more exploration of stories and pictures. These children also engaged in more pretend reading behaviors than the less secure children. The mothers of the secure children were observed to provide more explicit reading instruction (Bus & van Ijzendoorn, 1988).

Print Awareness

Print awareness occurs through storybook reading, environmental print, play with alphabet letters, and writing activities. Through repeated exposure to print at early ages children learn that it is the print on a page that is read and not the picture. Therefore, they associate the print as being meaningful and containing the content of the story. Children also learn about culturally appropriate print conventions such as left-to-right and top-to-

bottom directionality, punctuation, titles, capitalization, and letter-word-sentence hierarchies in English.

Justice and Ezell (2000) conducted an experiment to see if training enabled parents to reference print more often during storybook reading and if so, did print-referencing influence their preschool children's word and print awareness? They also wanted to see if parents who used print-referencing felt better about shared reading experiences than those parents who did not. The parents were taught to reference print through verbal comments, questions, and requests about print, as well as through nonverbal references such as pointing to print or running the finger under each word or sentence as it was read. The four-year-old children in the dyads were tested on their abilities to recognize words as distinct units, name letters, pretend to read, segment one to three words, and complete a modified test of print concepts such as directionality. Each dyad practiced shared reading with parent-led print-referencing for four weeks using eight different books.

Results indicated statistically significant effects for the experimental group using the print-referencing behaviors of comments, requests, questions, and tracking. There were no significant group differences in pointing to print. Significant main effects were also noted for the number of times per minute each print-referencing behavior was used for all five behaviors. Finally, time and group interactions were also found across all five parameters of print-referencing for the experimental group. Regarding the children's performance, the experimental group improved more than the control group on all measures except alphabet knowledge. Significant differences were only found in three areas including words in print, print concepts, and word segmentation which suggested that the parents' scaffolding of print awareness resulted in the children's improved

understanding about print. Parents of the children in the experimental group also felt better about the storybook interactions in that they thought that their children's alphabet knowledge and print awareness in particular had improved as a result of the print-referencing strategies (Justice & Ezell, 2000)

Comparable results were achieved in a similar study by Justice and Ezell (2002) in which low-income children enrolled in Head Start programs participated in storybook reading experiences with an emphasis on print-referencing. Both the control and experimental groups improved, but there was a main effect for the experimental group. The performance of the experimental group was statistically significant in the case of four out of seven subtests, including print recognition, words in print, alphabet knowledge, and print awareness.

Vygotsky and Emergent Literacy

As has just been reviewed, print awareness and shared storybook reading are both important components of the home literacy environment. Research has also shown that mothers naturally begin to scaffold during book experiences with young children by pointing, labeling, and asking questions to their young children (Bus & van Ijzendoorn, 1988, 1997; Senechal, Cornell, & Broda, 1995). Strong theoretical support exists for this scaffolding or bootstrapping behavior. Specifically, these reading behaviors are validated by Vygotsky's social development theory.

Vygotsky believed that thought and speech were highly interrelated with language ultimately forming the basis of thought (i.e., people think in words). He advocated language as a socially mediated process that was highly dependent on culture (Vygotsky, 1978, 1986). For example, an infant wants a drink and reaches for a bottle. The child cannot reach the desired object and vocalizes while reaching until an adult responds by

giving the bottle to the child. The child's nonsocial reaching and vocalization was socially mediated by the adult's response so that the infant now internalizes the notion that a reaching behavior and/or vocalization leads to obtaining a desired object. Now the bottle becomes part of a social context for the child. Through this ongoing social mediation, children increase their language skills and cognitive abilities. Vygotsky would assert that these linguistic and cognitive gains occur twice, via the interpsychological social plane occurring between people and then through the intrapsychological category that develops within the child as internalization occurs (Vygotsky, 1978, 1986).

Vygotsky's theories have been embraced by the educational community and form a foundation for many pedagogical beliefs and current practices today. One of the key constructs of Vygotsky's theories is the notion of the Zone of Proximal Development (ZPD). ZPD may be described as the gap between a child's actual developmental level when completing a task independently versus the level of potential development with advanced guidance from adults or peers. The ZPD can vary depending on the kind of task, the type of instruction given, and the child's current developmental level in that particular area. (Vygotsky, 1978, 1986). For example, an 18-month-old given a board book might turn the pages, look at the pictures, and even perhaps act upon the book by petting a picture of an animal. However, with scaffolded instruction the same child might point to pictures, label pictures, vocalize appropriate sounds (such as animal noises), and answer simple questions as an adult mediates the literacy experience.

This type of scaffolded instruction occurred in the mother-child dyads as mothers labeled pictures following a child's point, expanded a child's verbalization, asked questions, tracked print with a finger, pointed out print conventions, and recruited attention to text, pictures, or story grammar (Bus & van Ijzendoorn, 1988, 1997; Senechal

et al., 1995). Justice and Ezell (2004) developed a specific print-referencing paradigm based on Vygotsky's ideas of ZPD, cultural mediation, and interpsychological to intrapsychological development. Citing a child's print interest as an early developing metalinguistic milestone at approximately one year of age, they believed that children can be bootstrapped through a hierarchy of learning about print through print function (i.e., that print is read and conveys the story), print conventions, print forms (i.e., alphabet and word awareness and recognition), and print part-to-whole relationships (i.e., words and sentences). Parents can be taught to scaffold this early print interest through nonverbal cues such as pointing to and tracking print, and using verbal cues including questions, comments, and requests about print.

As the parents cue in the child's ZPD, the child develops increased understanding about print concepts. In turn, the parent continues to attach more intricate meaning to the print and the child begins to understand that sentences are composed of words. Ultimately the child discovers that these words are formed with letters based on auditory speech sounds. While this is occurring, the child's understanding changes from the initial parent-directed social and intrapsychological process to internalizing the concepts interpsychologically. This type of interaction and scaffolding can occur not only with regard to print awareness, but also shared storybook reading, oral language development, writing, spelling, and play skills.

Evidence for Early Acquisition of Print

The acquisition of oral and written modes of processing language is traditionally viewed as occurring through different mechanisms and processes. Oral language is thought to be learned effortlessly whereas reading and writing are viewed as secondary abilities, learned with much conscious effort and repetition, usually requiring explicit

teaching (van Kleeck, 1998; Stadler & McEvoy, 2003; Justice & Ezell, 2004). However, specific neural mechanisms are required for reading, as evidenced by the existence of developmental dyslexia (Sakai, 2005). Although these mechanisms are not yet understood, many studies have established a link between poor reading and weaknesses in auditory processing of phonological information (Beaton, 2004). This suggests that reading may be more innate and biologically determined than some theorists believe.

Dehaene (2004) discussed whether the human brain had evolved so that special processors for arithmetic and reading were created making humans predisposed to read. He explained that the "visual word form area" (VWFA) is a specific area in the left occipito-temporal sulcus of the brain that is highly specialized for print reading tasks. Functional Magnetic Resonance Imaging (fMRI) studies have repeatedly demonstrated systematic activation of this neural region during reading tasks of real or nonsense words and to a much lesser extent with chains of consonants. The VWFA can be readily identified on any human and within millimeters of the same neural location in each person.

Dehaene (2004) listed several reasons why the VWFA plays a pivotal role in the potentially innate process of learning to read. The VWFA is functionally specialized for reading written words and is not activated with spoken words. Lesions to this area of the brain result in pure alexia, but no other linguistic deficits. The fact that the VWFA is activated with real words or nonsense words than can be pronounced suggests that the neural area has actually been changed and shaped by the written word system of the specific culture. The reason for this assertion is that strings of consonants that are not words or pseudo-words are not processed, even though they may be words in another language. This idea is very similar in concept to the native language magnet model of

spoken language discussed later in this paper (Kuhl & Williams, 1992; Kuhl & Meltzoff, 1996). Finally, the VWFA can make quick decisions about words regardless of letter case, which indicates that the system attuned to the particular demands of the graphemes of a specific language.

In establishing his argument for a potential neural predisposition for reading, Dehaene (2004) noted the location of the VWFA as being quite remarkable. Its placement in the left occipito-temporal sulcus is strategically located near areas of high visual acuity and the multiple language areas located in the left cerebral hemisphere, so that rapid and complex processing of language and visual input can occur. However, Dehaene speculated not so much that the brains of humans were specifically wired for innate reading abilities, rather that the neurology itself had informed the written language. In other words, the writing system developed out of the constraints of the neurological and visual systems so that written language could be readily decoded and interpreted using the existing and highly plastic neurology that humans possess. Dehaene suggested a neuronal "recycling" or "reconversion" hypothesis that this specialized cerebral tissue is not the proverbial blank slate, but has innate properties that make it conducive to shaping from the environment to perform specialized functions such as reading. He termed this process "recycling" since it is continuous neural process with cultural intervention as the catalyst.

Other evidence for the proposition that reading may be a mode of processing language, rather than a learned secondary ability, may be found in the acquisition of sign language. Infants begin to babble around six to eight months of age, produce one-word utterances between 10 to 12 months, and combine words near their second birthday. These acquisitions correlate with massive increases in brain volume during these time

periods (Beaton, 2004). Importantly, this same course of development is seen in the acquisition of a visual mode of language, that is, manual sign. When the environmental exposure is consistent and meaningful, both deaf and hearing infants begin with a period of "babbling" in sign, they acquire single word signs at or around their first birthday, and word combinations at or around their second year. Infants learning sign exhibit the same linguistic, semantic, and conceptual complexity, stage for stage, throughout the acquisition period. These findings suggest that speech, per se, is not critical to the human language acquisition process and that the infant brain may be sensitive to any modality in which language is presented (Petitto, Holowka, Sergio, Levy, & Ostry, 2004).

Previous research has indicated that infants learn to pair auditory information from voices to the visual input from faces as early as three months of age (Brookes, Slater, Quinn, Lewkowicz, Hayes, & Brown, 2001). That skill is a necessary foundation to matching visual graphemes to auditory phonemes due to the mapping of the visual with the auditory. Slater and Quinn (2001) also documented that face recognition abilities are present at birth and that infants easily imitate facial gestures. Taking this into account, perhaps infants are learning more during early storybook experiences than previously thought.

Preissler and Carey (2004) demonstrated that by 18 months of age, children were able to make referential pairings between words and real objects and between pictures and real objects. They found that 18- and 24-month-old children understand that pictures are symbols for actual objects in the real world. When taught the label of an unfamiliar pictured object, these children transferred that label to the actual object and not just the picture. It is also at this age that children begin to point at pictures with intent, rather than

just grabbing or acting upon pictures (Murphy, 1978; DeLoache, Pierroutsakos, Uttal, Rosengren, & Gottlieb, 1998, as cited in Preissler and Carey, 2004; DeLoache, 2004).

In a study of 9-, 14-, 20-, and 24-month-old infants, Murphy (1978) noted that while 14-month-olds pointed during storybook reading with their mothers, that they were also very interested in turning pages. At 20 months of age, the infants engaged frequently in both page-turning and pointing actions during reading, but at 24 months the infants were less active, more attentive, with pointing and vocalizing becoming a focal point of the reading experience. The pointing behaviors were quite variable between the ages with the 20-month-olds having significantly more points than the 14-month-olds. The older infants also pointed in "pointing strings," which were a series of pointing gestures on one page or to components of a picture. The younger infants, although pointing, also tended to "act upon" the book (hitting, grabbing, scratching) frequently (Murphy, 1978; DeLoache, 2003). Murphy (1978) also found that the older groups of infants were more likely to name the pictures when they were actively pointing and surmised that gestures and labels were cohesively established at approximately 20 months of age.

In addition to the pointing, referencing, and increased attention of older infants during storybook reading, infants were also developing speech perception and phoneme processing skills at very young ages. By the age of six months, infants preferred only phonemic prototypes of their native language, a concept referred to as the native language magnet model (Kuhl & Williams, 1992; Kuhl & Meltzoff, 1996). Furthermore, infants as young as 12-20 weeks of age were able to approximate adult vowel production in an imitative context (Kuhl & Meltzoff, 1996). However, a determination of whether infants relied more on the auditory input of the vowels, the visual input of the accompanying facial movements, or a combination of both has not yet been proven. Regardless, infants

did produce similar vowels in response to the adult productions and these infant vocalizations became more accurate with age. This implied that infants hear and imitate, but then must also hear their own speech to revise and adapt their speech productions.

Researchers recommending frequent and early experiences with print do so based on our current understanding of early neurological development. While most of the brain's cells are formed before birth, most of the connections with other cells form during the first three years of life. This development continues to change after age three as connections are refined based on experience. Thus, early experience helps to determine how brain cells will connect to each other. We know that babies deprived of normal stimulation fail to make the necessary connections for language and other abilities (Jensen, 1998; Shore, 1997). Early experience with print may be more critical to learning written language than is currently recognized, and the association of letters to the phonology of language may be acquired (rather than learned) earlier than a secondary language ability model would predict.

The fact that children who enter school with limited storybook reading experiences at home quickly fall behind in reading and often never catch up provides some evidence that this proposition may be hold some validity. Decades of research and different teaching techniques have shown that children raised in poverty generally have few hours of reading exposure prior to entering school, and that they are four to10 times more likely to experience long-term failure in learning to read than their middle class peers (Adams, 1990; Snow, Burns, & Griffin 1998). The possibility remains that early exposure to print and letters during the first three years of life is important for foundational connections between brain cells to form. This contention is further supported by the findings of the Committee on the Prevention of Reading Difficulties in

Young Children that letter identification at age five years is the strongest predictor of future reading ability, but that teaching letters at that age does not by itself improve success with reading for children with low literacy experience (Snow, Burns, & Griffin 1998).

Purpose of Study

The existing literature from many disciplines suggests that the human infant's brain may be more receptive to the acquisition of print (i.e., letters) as a modality for processing the phonology of language at an early age than a secondary ability model would predict. Therefore, the purpose of this study is to determine if toddlers (20-24 months old) can demonstrate awareness and understanding of alphabetical letters and sounds. Although there is a plethora of current literature discussion of emergent literacy and early development of phonemic awareness, there has been little investigation of these skills in infants and toddlers. Therefore, this experiment seeks answers to the following questions:

1. Are 20-24 month old toddlers capable of learning letter and sound skills following six weeks of exposure?
2. Will 20-24 month old toddlers maintain any gains following six weeks without specific exposure?
3. What types of letter awareness and letter-sound awareness skills can be demonstrated by 20-24 month old toddlers following six weeks of exposure?
4. What developmental and environmental factors contribute to a 20-24-month old toddler's ability to learn letter and sound skills?

METHODS

This study examined the acquisition of alphabetic and phonemic awareness skills in toddlers. The participants were exposed to letters and their corresponding sounds within the context of shared reading of an alphabet book. The individual reading sessions occurred at the children's daycare centers in a separate room from the classroom. At three separate times during the experiment the children were evaluated using the same set of 35 experimental tasks to assess letter and phoneme awareness skills. These scores were analyzed and compared to responses from a home literacy questionnaire that the parents completed.

Subjects

Sixteen toddlers were recruited from two local preschools in Baton Rouge, Louisiana. To qualify for the study, subjects met the following criteria:

1. A chronological age 20-24 months at the beginning of the study;
2. Written parental consent for participation;
3. Completion of case history forms;
4. Typical sensory and motor skills per parent report; and
5. A Total Language Score of at least 85 on the *Preschool Language Scale-4.*

Permission to solicit participants from the daycare and conduct the experiment onsite was obtained from each daycare director. Individual meetings were held with each director to review the purpose of the study, the amount of time and involvement it would take, and answer any questions. Once the daycare directors agreed to the study, a similar discussion occurred with each classroom teacher although they were just told that the purpose of the study was "to see what children might be learning from books." In consultation with the teachers, a list of children who met the age requirements was

determined. Consent forms were distributed to the parents of each eligible child by the daycare center (see Appendix A). The examiner spoke with each parent who returned a form or expressed interest, explained the information on the consent form, and answered questions.

The parents then completed a brief case history form detailing family structure, parental education level, as well as the child's birth, medical, and developmental history (see Appendix B). A home literacy questionnaire was also completed by a parent at a later date (see Appendix C). This questionnaire probed areas of direct and indirect literacy via questions about reading, print referencing, discourse, play, and so forth that parents responded to using a Likert scale. The scores that were obtained were used to determine the influence of home literacy experiences on overall test gains.

A brief language sample was elicited from each child to assess phonemic inventory, particularly of the target phonemes / p, b, m, s, t, k, l, i, oU/, to determine if they had established these phonemes. Nine of the children had established all of these phonemes in isolation and/or in the initial position of single words. Of the children who were unable to produce the nine target phonemes, five of them produced one phoneme incorrectly and two of them had two phonemic substitution errors. Table 1 shows the phonological errors that were perceived during the initial evaluation.

Table 1

Number and Type of Substitutions Made by Children with Phonological Errors

Types of errors	d/l	t/k	d/t	w/l	dentalized /s/
Number of children	1	3	2	2	1

These errors were noted and taken into consideration during the phoneme production task.

Table 2 provides a complete profile of the subjects including age in months, the *PLS-4* total quotient score which is a combination of the Auditory Comprehension and Expressive Communication subscores, the number of experimental readings which ranged from 11 to 17, the daycare literacy experience that was either rated as high literacy (HL) or low literacy (LL), direct and indirect home reading experiences that were derived from items reported by the parents on the home literacy questionnaire, and maternal education that ranged from high school plus some college coursework through advanced and professional degrees. Each of these factors had been shown in the literature to affect literacy development.

Table 2

Profile of Developmental and Environmental Factors for Each Subject

Subject	Age Mo	PLS-4 Score	# of Readings	Literacy Experience			Mat Edu[b]
				Daycare[a]	Direct	Indirect	
1 (C-E)	21	120	17	HL	25	27	MA+
2 (C-E)	20	111	16	HL	29	38	MA+
3 (C-E)	23	127	15	HL	55	44	MA+
4 (C-E)	22	115	15	HL	41	36	BA
5 (C-E)	23	115	17	HL	58	40	BA
6 (E-C)	24	97	17	HL	50	50	BA
7 (E-C)	22	117	15	HL	31	46	BA
8 (E-C)	23	130	16	HL	57	60	BA
9 (E-C)	22	124	17	HL	43	33	BA

(table continued)

Subject	Age Mo	PLS-4 Score	# of Readings	Literacy Experience Daycare[a]	Direct	Indirect	Mat Edu[b]
10 (E-C)	20	114	14	HL	35	35	BA
11 (E-C)	20	107	12	LL	52	49	HS+
12 (E-C)	24	120	16	LL	60	54	BA
13(E-C)	22	117	15	LL	53	51	MA+
14 (C-E)	20	111	17	LL	52	49	HS+
15 (C-E)	20	97	16	LL	52	36	HS+
16 (C-E)	21	115	11	LL	26	55	HS
Mean	21.69	114.81	15.38	----	43.69	43.93	-----
S.D.	1.45	9.14	1.78	----	12.38	9.26	-----

[a]Daycare was labeled by HL-High Literacy and LL-Low Literacy. [b]Maternal education was labeled by HS+-high school graduate with some college, BA-graduate of a 4 year college, MA+-completed graduated degree

These variables included age in months, the *PLS-4* total quotient score which is a combination of the Auditory Comprehension and Expressive Communication subscores, the number of experimental readings which ranged from 11 to 17, the daycare literacy experience that was either rated as high literacy (HL) or low literacy (LL), direct and indirect home reading experiences that were derived from items reported by the parents on the home literacy questionnaire, and maternal education that ranged from high school plus some college coursework through advanced and professional degrees. Each of these factors had been shown in the literature to affect literacy development.

Children were placed in either the alphabet picture book condition or control group condition and were assigned based on age, gender, and daycare in an effort to make both groups equal. Equivalency across the two groups was determined by

chronological age and Total Language Score from the *PLS-4*. Independent t-tests for Equality of Means showed the mean age of the first experimental group of 22.13 months (SD = 1.55) was not significantly different from the control group age of 21.25 months (SD = 1.28) (t = 1.229, df = 14, p>.05), and that the PLS-4, mean Total Language Score of 115.75 (SD = 10.17) was not significantly different from the control group mean of 113.87 (SD = 8.58) (t = 0.399, df=14, p>.05). Table 3 shows that Levene's Test for Equality of Variances indicated that there were no significant differences between the two groups in regard to age and language scores means.

Table 3

Test of Equality of Samples with Equal Variances Assumed with Regard to Age and *PLS-4* Scores

	F	Significance
Age	0.057	.815
PLS-4 Scores	0.277	.607

Setting

The 16 participants represented 100% of the eligible children, including 10 from Daycare A and 6 from Daycare B. Both daycare centers were located in the same zipcode and approximately on block from each other. At Daycare A, which was much larger, the ten participants were divided among four different classrooms. There were children in each classroom who were not participants in this study since they did not meet the age requirements.

Print in the classrooms of Daycare A included each child's name on his or her "cubby," labeled photos of family members, artwork displays, and alphabet letters in some rooms. Additionally, several of the classrooms had blocks with letters on them, letter puzzles, and electronic letter toys such as LeapPad-type toys. Each classroom was divided into play centers, such as a book center, home living center, blocks center, and so forth. All of the toys were age-appropriate and well maintained. There was also a large centralized toy room from which teachers could check out different toys.

Upon observation, the teachers were noted to frequently engage the children in craft activities incorporating crayons and paint. The children were also read to daily, participated in circle time, listened to storybooks, sang children's songs, and played outside twice a day. Occasionally background music, both instrumental and vocal, was played on a tape player while the children played in centers. The teachers were also noted to engage in play with the children during free play in the centers and occasionally rock a child while reading or singing. Verbal praise for behavior (e.g., sharing) and accomplishment (e.g., art activity) was noted as well. This daycare was reflected to be a High Literacy (HL) environment.

Daycare B was a smaller facility and all of the children who participated were in one classroom, along with a few other children who did not meet the age requirements for the study. The children were in a fairly large physical space with two open rooms. One room contained shelves with toys, baskets of toys, and some large play items such as a kitchen set. However, many of the toys had missing pieces. For example, there was a dollhouse, but no accessible figures or furniture to use in play with the house. The other room contained a table with child-sized chairs and a television with a video-cassette recorder. The television was on during every visit to the daycare regardless of time of day

and the children were often instructed to sit down and watch children's programming on the TV or a children's video. They also provided some time for outside play daily and they occasionally played in centers as well. However, the television remained on throughout these activities.

The children were observed participating in one coloring activity about numbers and in a separate painting activity. There were no books in the room within the access of the children. A few books were noted on a high shelf in the room, but there was no picture book reading observed on any visits to the daycare. Some posters with print were displayed on the walls, but the children's names were not posted anywhere in the classroom that was readily visible. The teachers were not observed playing with the children, singing to them, or reading to them. Some verbal praise was given, but most communication tended to be highly directive such as "come here" and "sit down." This daycare was reflected as a Low Literacy (LL) environment.

For the reading and play sessions, as well as the assessments, the toy room at Daycare A was typically used. There was a large room with a wall dividing it in half. One side of the room was filled with plastic containers of toys on shelves, riding toys and strollers on the floor, and balls in a net suspended from the ceiling. On the other side were two rocking chairs, two stacks of highchairs, and empty floor space. The reading sessions either occurred with the child sitting on the researcher's lap in a rocking chair or seated side-by-side on the floor. The play activities occurred on the floor.

Testing at Daycare A was completed in the toy room with a small table and chair set up on the side of the room that did not contain the shelves of toys. Testing was sometimes completed in the dining area at a child-sized table with chairs depending on the time of day. Regardless of the room used, there were the occasional distractions of

babies crying and/or people coming in to retrieve a toy or walking by en route to another room.

At Daycare B, the reading and play activities generally occurred in the dining area at a small table with a low bench. The level of distraction was variable since the dining area was in the front of the building where parents dropped off and picked up their children. This area was also connected to the kitchen and the office, so ringing phones and meal preparation were occasional distracters as well. However, the children appeared to be able to maintain consistent joint focus on the reading or play activity with only minimal redirection to the task.

For the assessment sessions at Daycare B, a separate and empty classroom was used. These assessments were specifically scheduled in the late afternoons when classes were combined as children left for the day. This freed up an empty classroom with a door that could be closed, thereby reducing visual and auditory distractions. Occasionally parents or teachers did walk through the room, but the children were usually redirected easily.

Materials

Camera Equipment – A Sony 460x Zoom Handycam (CCD-TRV68) Hi8 Analog Camcorder was used to video record each administration of the assessment. The camera was placed on a tripod approximately 24 inches from the child and at a 90-degree angle.

Toys – Developmentally appropriate toys were used during control group sessions. These included Duplo blocks, Mr. Potato Head, vehicles, small plastic animals, balls, bubbles, and pretend food.

Phonic Faces Alphabet Book – The Phonic Faces (PF) book was comprised of a cover showing the letters A B C in Phonic Faces, followed by 9 pages, each profiling a

different letter (see Figure 1). The book was designed in a typical double-paged spread format, with 6 ¼" x 9 1/4" pages printed in full color on heavy card stock. Each letter page was comprised of a 3 x 5 inch color Phonic Face with the iconically represented phoneme depicted in the mouth. The upper- and lowercase letters were also shown in the lower left-hand corner of the Phonic Face picture. In addition to the Phonic Face, each page had two or three pictures that began with that letter and phoneme (e.g., /p/-pig, pink) accompanied by the printed word nearby.

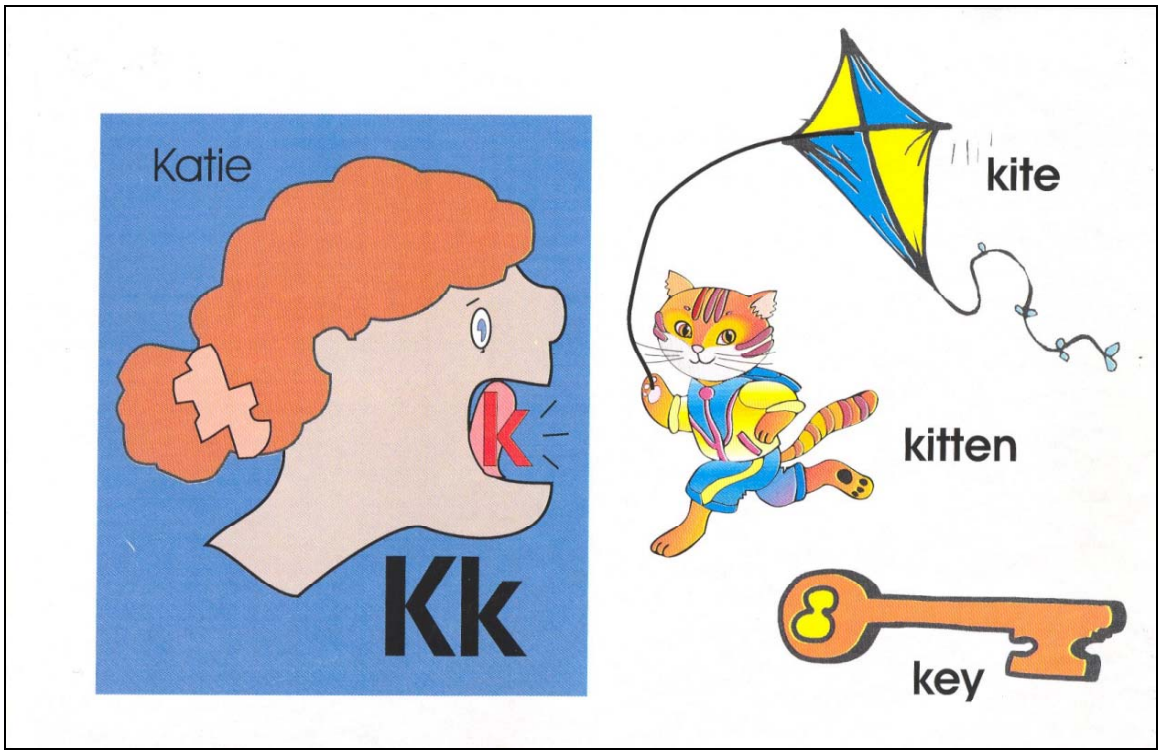


Figure 1. Representative page from the *Phonic Faces Alphabet Book*.

The letter/sounds presented in the book included *p, b, m, s, t, k, l, e*, and *o*, with the vowels being represented as long vowels /i/ and /oU/, respectively. These letter-sounds encompassed voiced and voiceless phonemes, plosive/fricatives/nasals, consonants and vowels, and a variety of articulator placements from bilabial to lingua-

velar. These phonemes were selected because they are typical early developing phonemes in a young child's phonological repertoire and are represented by highly iconic pictures on the PF cards.

Letter Name-Sound Assessment Pictures – Nine individual full color picture cards were used to assess letter and phoneme knowledge. The picture cards were 5"x 7", with the picture approximately 5" tall. The PF picture was composed of a full color line-drawing of a face with a letter forming the mouth within the face. This letter was approximately 1" tall and there was also a letter pair (upper- and lowercase) in the lower right or left hand corner of the card (See Appendix F). These individual cards were used for letter identification, phoneme identification, and phoneme production subtests.

For the identification of letters and sounds from a closed set of three, three standard sized PF cards, as described above, were printed onto a small poster-sized cardstock (17 x 22 inches) in a fixed series. All pictures were in full color. The stimuli for the letter and sound discrimination tasks were also in fields of three. These were also printed on 17 x 22 inch cardstock in a fixed series. However, instead of PF cards, 5" sized letters and numbers were used. These were printed in black and white (see Appendices E and F for examples).

Home Literacy Questionnaire- A home literacy questionnaire was developed based on a format similar to one used by Smith (1999). The questionnaire was modified to meet the needs of the current study and to be developmentally appropriate to the targeted ages of the participants. The questionnaire was composed of a list of direct and indirect questions about literacy with a few non-related questions interspersed. A Likert scale was used as a rating measurement, with parents responding with values of 0 to 5, with 0 representing never, 1 representing about once a month, 2 representing about once a

week, 3 representing several times a week, 4 representing almost every day, and 5 representing several times a day. Reliability checks of three sets of two similarly worded questions in both the direct and indirect literacy categories were also incorporated. Separate scores were calculated for direct and indirect literacy practices (see Appendix D.

The direct literacy questions pertained to use of writing implements, reading experiences, pointing and labeling, use of technology (such as computers and television), and exposure to books and letters in the home. The indirect literacy questions were focused more on tasks that are known to affect literacy in indirect ways such as play skills, following requests, talking about experiences, categorization, singing, and talking about photos and pictures in the home. Several foils, asking questions about favorite foods, self-help skills, and discipline, were also included in the questionnaire in an effort to decrease inflated responses to the literacy items.

Procedures

A within-subjects alternating treatment design was implemented, involving an intervention group and a control group. Subjects were administered a letter-sound assessment battery prior to the first intervention session and again immediately following the sixth week. At that point, the subjects reversed conditions so that those who had been read to using the Phonic Faces alphabet books now played during their sessions, and those who had been in the control condition received the book reading treatment for 6 weeks. Following the last session, the assessment was administered for the final time.

The experimenter, a speech-language pathologist with 16 years of experience, read a Phonic Faces (PF) alphabet book to the intervention group three times per week for six weeks. This experiment occurred over the summer and there were some absences due to vacation and illness. Every attempt was made to make-up absences, so that the

children were exposed to the alphabet book at least 15 times. All but three of the children met this criteria with those three only having 11, 12, or 14 exposures to the book.

Each reading session consisted of an individual child reading with the experimenter for approximately five minutes. The experimenter read each page to the child by pointing to the print (letter awareness) while naming the letter, producing its phoneme (phoneme awareness), and talking about how the other pictures on the page began with that letter and letter-sound token. The children were encouraged to imitate the letter name and its corresponding sound. Pointing to pictures and letters were used as visual cues and reinforcement.

The following represents a typical reading, "Here's Katie. She likes the letter "K." "K" says /k, k, k/. Here's a kite, a kitten, and a key. Those all start with the /k/ sound. DO you hear it? /k/--that's the letter "K."" More time was spent on a particular page if the child showed greater interest or wanted to re-read it. If the child spontaneously pointed to a letter or picture on the page it was labeled and then given a print or phoneme reference. For example, if a child pointed to a pig then the experimenter might say, "Yes, that's a pig. Look. It starts with the /p/ sound, 'pig.' I see the letter 'P' at the beginning of the word. Pig."

The control group received no treatment other than typical literacy experiences that occurred at home and in preschool. The parents and teachers were masked to the group placement. Each child spent time with the experimenter so that the teachers would not know which children were receiving the intervention. The children in the control group participated in a perceptual play task such as playing with blocks, Mr. Potato Head, or balls.

Measures

A battery of experimenter designed tests was used to assess knowledge of the alphabet letters and their corresponding sounds. The three administrations of the *Letter Name-Sound Assessment* were identical and consisted of seven tasks, each with five trials, for a total of 35 responses. Three of the tasks measured letter awareness for a total of 15 potential responses, and four tasks measured sound awareness, for a total of 20 potential points.

Children were seated beside the examiner as the stimuli were presented. The assessment took approximately 10-15 minutes. All assessments were videotaped with the camera at a 90-degree angle so that the child, the stimulus items, and the subsequent response could be seen. The letter and sound awareness tasks included the following seven subtests:

1. Letter Awareness Tasks (p, b, m, s, t, k, l, e, o)
    a. Finding Letters: A total of five PF cards (p, m, s, l, e) were presented, one card at a time. The child was prompted to find the letter. Prompts included, "Show me the letter," "Point to the letter," "Show me the "p." A correct response was a direct point to the letter in the mouth of the Phonic Faces character or to the letter printed in the corner of the card.
    b. Identifying Letters: A set of three PF cards (two consonants and one vowel selected from the target letters) were affixed to a poster and displayed horizontally. The child was asked to point to a specific letter. Prompts included, "Point to "p." "Show me letter "p." Five trials were given. A correct response was pointing to the correct card.

c. Discriminating Letters: A set of pictures comprised of two of the target letters (five inches tall) and a five-inch picture of a number was presented. These were affixed to a poster and displayed horizontally. The child was prompted to find the letter named. Prompts included, "Point to "p." "Show me letter "p." Five trials were given. A correct response was pointing to the correct card.

2. Sound Awareness Tasks

a. Sound/Letter Correspondence: A total of five PF cards (/k, oU, b, t, m/) was presented, one card at a time. The sound associated with the letter was produced by the examiner. The child was prompted to find the letter associated with the sound. Prompts included, "Show me /k/," "Where is /k/?" A correct response was a direct point to the letter in the mouth of the PF character or on the corner of the card.

b. Identifying Sounds: A set of three PF cards (2 consonants and 1 vowel selected from the target letters) were affixed to a poster and displayed horizontally. The sound associated with the letter was produced by the examiner. The child was prompted to find the letter associated with the sound. Prompts included, "Show me /s/," "Where is /s/?" Five trials were given. A correct response was pointing to the correct card.

c. Discriminating Sounds: A set of pictures comprised of two of the target letters (five inches tall) and a five-inch number was presented. These were affixed to a poster and displayed horizontally. The sound associated with the letter was produced by the examiner. The child was prompted to find the letter associated with the sound. Prompts included, "Show me /s/," "Where is /s/?" Five trials were given. A correct response was pointing to the correct card.

d. Producing Sounds: A total of five PF cards (s, k, m, o, b) were presented one card at a time. The child was prompted to produce a sound associated with the letter in the mouth of the PF. The examiner pointed to the letter and prompted, "What sound does he/she make?," "What does he/she say?" A correct response was scored if the child produced the sound associated with the letter.

Scoring

The experimenter administered all of the assessments and scored them. All scoring was completed at the time of the assessment with the children receiving one point for each correct answer and zero points for incorrect responses. No partial credit was given. The scores were added together into subtest scores with a maximum of five points each and total test scores with a maximum of 35 points.

On occasion a child would point to more than one response. In these cases the first response was the one scored unless it was evident that the child was making a self-correction, such as stating "Oh!" and specifically pointing to a different card, making a deliberate point to a different item while repeating the stimulus, or presenting an obvious change in facial expression that indicated recognition of a mistake with a subsequent self-correction. If the examiner judged that a deliberate self-correction was occurring, then the score was changed (whether to a correct or incorrect response) and a notation was made to indicate self-correction. However, several times a child would just start pointing to different pictures with little awareness and poor joint attention. In those instances only the initial response was scored. There were also occasions in which the child made no response. When that happened the examiner repeated the question and reminded the child to point to (or say, depending on the task) the answer with a sweeping motion over the

pictures. If the child continued to remain unresponsive to the item, then it was scored as incorrect.

Reliability

Interjudge reliability measures were completed to assure reliable scoring. The tasks selected for interjudge comparison were the tasks requiring the child to find a letter in the single PF picture in the pre-test condition, find a specific phoneme from a closed set of three PF pictures in the mid-test condition, and produce the sound associated with a given letter in the post-test condition. The first task was a letter awareness task with a single card, the second task was a sound awareness task with three cards on a poster, and the third task was a phoneme production task with single cards. These subtests were analyzed in the context of the pre-test, mid-test, and post-test conditions, respectively. Each task was scored by two independent judges at separate times. These judges were graduate students in the Department of Communicative Disorders at the University of Wisconsin-Stevens Point. Each judge watched a video of the children completing the subtest of interest and marked a score sheet as + (correct, 1 point) or – (incorrect, 0 points) for each item. The interjudge agreement is described both in terms of percent agreement and Cohen's kappa scores. Lombard, Snyder-Duch, and Bracken (2005) suggested that percent agreement alone is an insufficient means of establishing interjudge reliability as it tends to be misleading in and of itself and can be a liberal measure. There are several indices to measure interjudge reliability, but no consensus as to the best one. Cohen's kappa was selected because it is one of the more common indices and easily accessible in the Statistical Package for Social Sciences (SPSS).

For the task of finding the letter of a single PF card, the percent agreement between the experimenter and the first judge was 90% (k = .796), with the second judge

and the experimenter agreeing 88% (k = .714). Since the value of kappa is statistically significant from zero, its values of .796 and .714 suggests that the judges' ratings are largely similar to the experimenter's rating.

On the subtest where the child had to select a phoneme represented by a PF card from a field of three, only 13 of the 16 participants were scored due to video-recording errors. The responses of three of the children were not easily visible and therefore could not be scored by videotape alone. For the 13 children scored, the first judge had 95% (k = .875) agreement with the experimenter and the second judge had 93% (k = .812) agreement. Both of these scores indicate high reliability between the experimenter's scores and each judges' ratings.

The final subtest scored was the post-test sound production in which the child was shown a single PF card and asked to produce its corresponding sound. On the sound production subtest only 12 of the 16 children were scored due to poor sound quality on some of the recordings. Of the 12 children scored, the percent agreement between the experimenter and the first judge was 95% (k = .903) and 99% (k = .968) with the second judge. These high kappa values suggest a strong consensus between the scores of the experimenter and each judge, with an approximate significance of <.001.

RESULTS

The questions proposed by this study asked whether toddlers would show an awareness of letters and related sounds after consistent exposure to alphabet books; if so, would they maintain any gains after a period of no intentional exposure to those concepts; and if factors could be identified that contributed to early success in emerging phonemic and print awareness. Seven measures of letter and letter-sound awareness were compared at pre-test, and then following each six week intervention phase when the treatment groups were alternated.

Letter and Letter-Sound Awareness

The first question of this study asked whether 20-24 month old toddlers would show an awareness of letters and letter-sounds following six weeks of exposure. The second question asked whether the gains would be maintained (indicating acquisition rather than memorization). Table 1 profiles the mean scores at pre-test and following each six week experimental phase for the three measures of letter awareness (finding letters versus non-letters, identifying specific letters with Phonic Faces and print, and finding specific letters with print only) and four measures of sound awareness (finding the letter on a card when given a sound, finding a letter when given a sound from a choice of three, discriminating between two sounds, and producing sounds given a letter).

The means and gain scores for the group exposed to the Phonic Faces alphabet book during the pre- to mid-test phase (Experimental – Control Group) (E-C) are compared to the group who did not receive exposure to the book until Phase 2 (Control – Experimental Group) (C-E) in Table 4. Note that the mid- to post-test phase scores also serve as the post-test scores of the study.

Table 4

Means and Standard Deviations for Three Measures of Letter Awareness and Four Measures of Sound Awareness Obtained by 20-24 Month Old Experimental and Control Group Toddlers at Pre-test, Following the First 6-Week Experimental Phase (Mid-test), and Following the Second 6-Week Experimental Phase (Post-test)

	Experimental-Control Group				
	Pre-test	Mid-test	Gain	Post-test	Gain
Find any letter	2.87 (1.64)	3.75 (1.58)	+0.88*	4.50 (1.07)	+0.75*
Find letter w/ PF	1.00 (0.76)	3.00 (1.51)	+2.00*	3.00 (1.31)	0.00
Find letter w/o PF	1.25 (0.71)	2.13 (0.83)	+0.88*	1.88 (1.46)	-0.25
Total Ltr Awareness	5.12 (2.27)	8.88 (3.22)	+ 3.76*	9.38 (3.29)	+0.50
Sound/ltr association	2.75 (1.39)	4.00 (0.53)	+1.25*	3.88 (1.25)	-0.12
Identifying sounds	2.00 (1.20)	3.00 (1.77)	+1.00*	3.25 (1.39)	+0.25
Discrim. sounds	1.75 (1.16)	2.38 (0.58)	+0.63*	1.63 (0.74)	-0.75
Producing sounds	0.13 (0.35)	1.88 (1.81)	+1.75	2.25 (1.83)	+0.37
Total Snd Awareness	6.63 (1.85)	11.26 (3.33)	+4.63	11.01 (2.83)	-0.25

(table continued)

	Control-Experimental Group				
	Pre-test	Mid-test	Gain	Post-test	Gain
Find any letter	1.50 (1.77)	2.13 (1.64)	+0.63	2.75 (1.75)	+0.62
Find letter w/ PF	1.00 (0.76)	1.88 (1.13)	+0.88	2.75 (1.49)	+0.87*
Find letter w/o PF	1.13 (1.13)	1.38 (0.74)	+0.25	2.75 (0.89)	+1.37*
Total Ltr Awareness	3.63 (2.62)	5.39 (2.88)	+1.76	8.25 (3.12)	+2.86
Sound/ltr association	1.63 (1.77)	1.75 (1.98)	+0.12	2.13 (1.25)	+0.38*
Identifying sounds	1.50 (1.31)	1.25 (0.89)	-0.25	2.25 (1.75)	+1.00*
Discrim. sounds	1.75 (1.16)	1.00 (1.41)	-0.75	1.88 (1.13)	+0.13*
Producing sounds	0.13 (0.35)	0.38 (0.74)	+0.25	2.00 (2.14)	+1.62*
Total Snd Awareness	5.01 (3.66)	4.38 (3.34)	+0.63	8.26 (4.74)	+3.13

*Represents greater gain than comparison group

Examination of the means shows that the gain scores from Pre-test to the end of Phase 1 (Mid-test) were greater for the experimental group than the control group for all seven subtests. Similarly, the mean gain scores from Phase 1 to the end of Phase 2 (Post-test) were greater for the alternating experimental group (previously the controls) than for the controls (previously the experimental group) for all subtests except finding any letter located on a card. Of particular interest is the Child Group by Time of Measurement interaction which would indicate if the difference between Child Groups varied as a function of time. Results of Mauchly's Test of Sphericity ($W = .748$, $df\ 2$, $p < .151$)

revealed that the error variances across groups and times were approximately equal. The ANOVA results revealed significant differences for Time of Measurement ($F = 8.831$, $df = 2, 28$; $p < .001$, Partial Eta Squared = .387) and the Child Group by Time of Measurement interaction ($F = 4.638$, $df = 2, 28$, $p < .018$, Partial Eta Squared = .249).

Sound Awareness Tasks

Figure 2 shows the Sound Awareness Scores for the two Child Groups as a function of Time of Measurement. As indicated by the significant Time of Measurement factor, both Child Groups increased their Sound Awareness scores from the Pre-test to the Post-test. Of more interest is the interaction effect. Tests of simple main effects using t-tests with a Bonferroni correction showed that there was no difference between the two Child Groups at Pre-test ($t = 1.120$, df 14, $p < .282$), indicating that the two groups were equal prior to intervention.

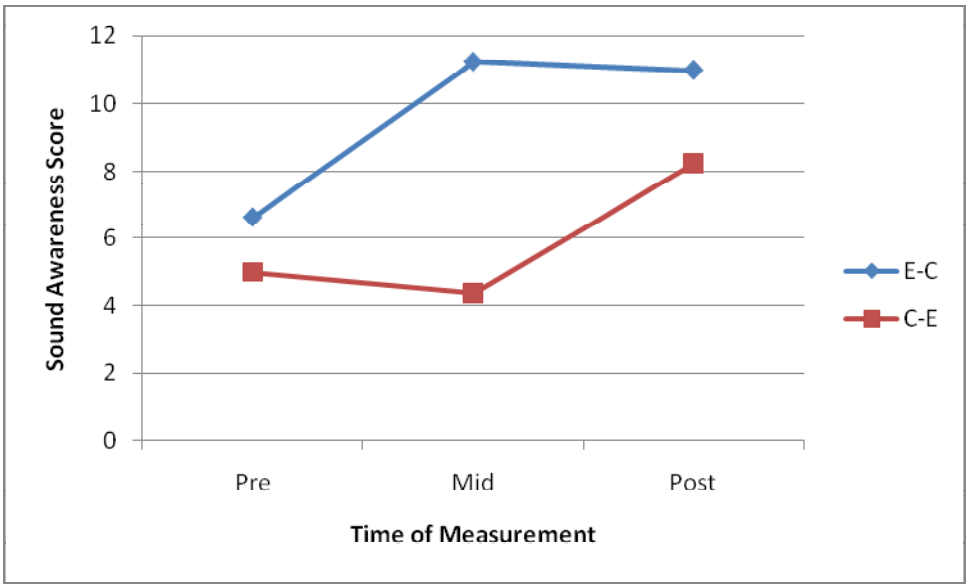


Figure 2. Comparison of scores for the combined sound awareness tasks shows each group increased in performance only following their respective experimental phases, and that E-C maintained increases following a period of no specific exposure to letter-sounds.

At the Mid-test period, the score of the E-C group was higher than the score for the C-E group ($t = 4.127$, df 14, $p < .001$), indicating that the subjects who engaged in the experimental interaction during Phase 1 increased their Sound Awareness to a greater degree than the control group. At Post-test, both groups are again equal ($t = 1.436$, df 14, $p < .092$), indicating that C-E group increased their Sound Awareness at a greater rate than the E-C group during Phase 2 to nearly the same level. In summary, these results provide two comparisons showing that the Child Group who engaged in the experimental interaction increased their Sound Awareness compared to a control group who did not engage in the experimental interaction. The relatively small decrease in Sound Awareness demonstrated by the E-C group during Phase 2 also suggests that the gain in Sound Awareness is maintained following six weeks with no further specific exposure.

Letter Awareness Tasks

The Letter Awareness data revealed a nonsignificant Mauchly's Test of Sphericity ($W = .905$, df 2, $p < .523$), indicating equivalence at pre-test. The ANOVA resulted in a significant factor of Time of Measurement ($F= 21.389$, df 2, 28, $p < .0001$, Partial Eta Squared = .604), but not the interaction of Child Group and Time of Measurement ($F= 1.738$, df 2, 28. $p < .110$). As seen in Figure 3, the E-C group appears to improve its average score faster than the C-E group during Phase 1 and the C-E group appears to improve its average score faster than the E-C group in Phase 2. Both of these effects would be predicted by the experimental hypothesis. However, the C-E group also shows considerable improvement during Phase 1 when it was the control group. This indicates that learning was occurring for the control group as well as the treatment group during the intervention phase.

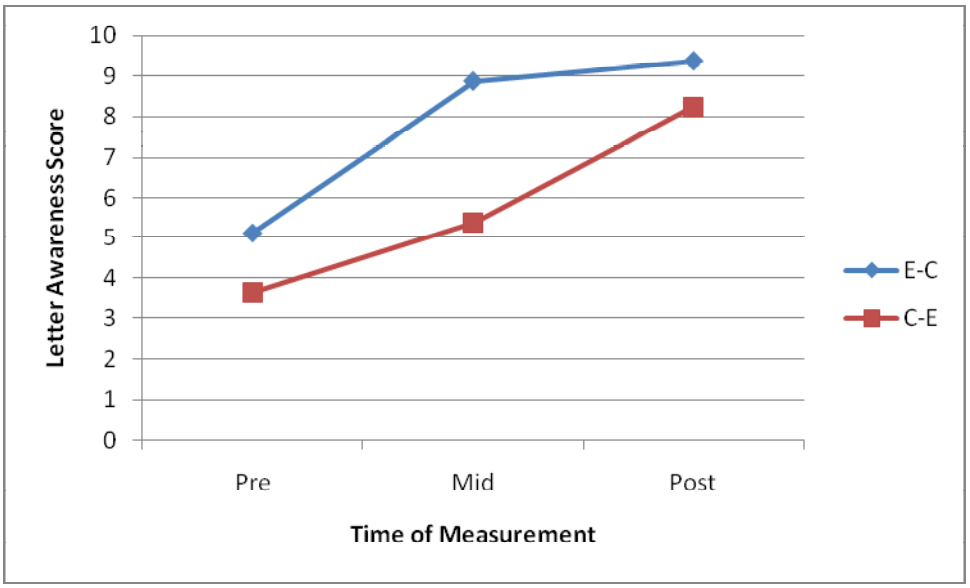


Figure 3. Comparison of scores for the combined letter awareness tasks shows each group increased in performance following their respective experimental phases, but the control groups also showed increases. E-C showed increased gains following a period of no specific exposure to letters.

These results indicate that both letter and sound awareness increased following exposure to Phonic Faces book reading and that gains were maintained following six weeks of no exposure. However, letter awareness also increased during the control phases for both groups, indicating that other sources of exposure to letters also had an effect on increasing letter awareness. In contrast, increases in sound awareness were seen only immediately following exposure to the Phonic Faces alphabet books.

Types of Letter Awareness and Letter-Sound Awareness Skills

The third question of this study asked what types of letter awareness and letter-sound awareness skills would be demonstrated by 20-24-month old toddlers following six weeks of exposure. Figure 4 displays the average change in task performance from pre-test to post-test for all of the children, each of whom had six weeks of exposure at post-test. This figure shows an increase from pre-test to post-test for all tasks with the

exception of discriminating sounds (i.e., finding a printed letter from a choice of three symbols to correspond with the sound produced by the examiner).

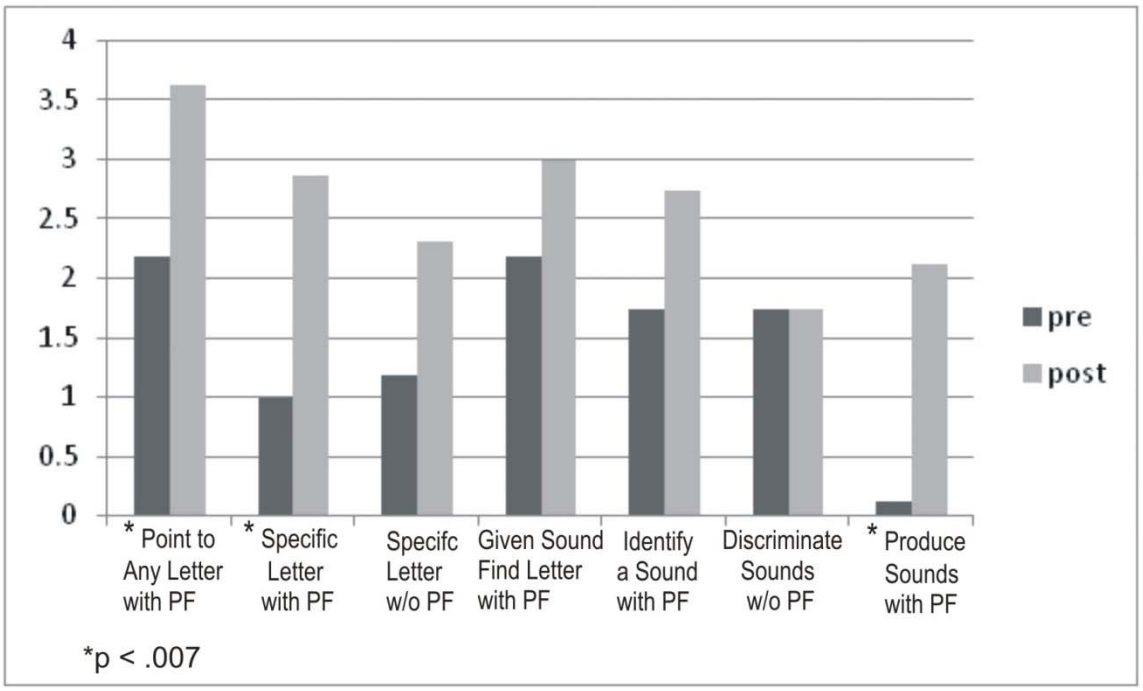


Figure 4. Comparison of pre-test and post-test scores for all children shows significant changes in finding any letter given a Phonic Faces card, finding specific letters given Phonic Faces, and producing sounds in response to a Phonic Faces letter.

To determine if these pre-test to post-test changes were reliably different, data for each task were compared via t-statistic using the Bonferroni Correction which set the alpha level at $p < .007$ for each comparison. Using this criterion, the change from pre-test to post-test was significant for finding letters (any) on a series of Phonic Faces cards, finding specific letters given a choice of three Phonic Faces cards, and producing sounds in response to a specific letter pointed to in the mouth of a Phonic Faces card.

Factors Affecting Growth

The fourth question of this study asked what developmental and environmental factors would contribute to a 20-24-month old toddler's ability to learn letter and sound skills. Table 5 profiles each subject across several variables and subtests scores.

Table 5

Profile of Developmental and Environmental Factors for Each Subject that were Compared to Pre-test-Post-test Gain Score to Determine Which Influenced Letter and Letter-Name Acquisition

	Age	PLS-4	# of	Literacy Experience			Mat	Letter/Letter Sound Score			
Subject	Mo	Score	Read	Daycare[a]	Direct	Indirect	Edu[b]	Pre	Mid	Post	Gain
1 (C-E)	21	120	17	HL	25	27	MA+	5	7	14	9
2 (C-E)	20	111	16	HL	29	38	MA+	13	5	10	-3
3 (C-E)	23	127	15	HL	55	44	MA+	11	15	28	17
4 (C-E)	22	115	15	HL	41	36	BA	16	17	19	3
5 (C-E)	23	115	17	HL	58	40	BA	0	7	16	16
6 (E-C)	24	97	17	HL	50	50	BA	8	15	12	4
7 (E-C)	22	117	15	HL	31	46	BA	10	11	17	9
8 (E-C)	23	130	16	HL	57	60	BA	14	21	21	7
9 (E-C)	22	124	17	HL	43	33	BA	11	18	20	9
10 (E-C)	20	114	14	HL	35	35	BA	8	19	21	13
11 (E-C)	20	107	12	LL	52	49	HS+	17	24	29	12
12 (E-C)	24	120	16	LL	60	54	BA	11	24	21	10
13 (E-C)	22	117	15	LL	53	51	MA+	15	29	25	10
14 (C-E)	20	111	17	LL	52	49	HS+	12	19	25	13
15 (C-E)	20	97	16	LL	52	36	HS+	0	4	7	7
16 (C-E)	21	115	11	LL	26	55	HS+	12	6	13	1
Mean	21.69	114.81	15.38	----	43.69	43.93	-----	10.19	15.06	18.44	8.25
S.D.	1.45	9.14	1.78	----	12.38	9.26	-----	5.02	7.68	6.10	5.29

The table also profiles the total raw score obtained by each subject at pre-test, mid-test, and post-test, as well as the total gain score which is the difference between the pre-test and post-test score. The gain score represents the point where both groups had received six weeks of intervention and six weeks with no specific attention to letters and letter names. Group assignment is also indicated with C-E indicating the control group for Phase 1 who became the experimental group in Phase 2, and E-C referring to the Phase 1 experimental group who became the control group during Phase 2. The table shows that an equal number of subjects from each group were from the high and low literacy daycares.

A Pearson correlation was completed to determine which factors impacted the ability to identify and discriminate letters and their corresponding sounds. The factors of *PLS-4* scores, subject's age, number of reading sessions, home literacy score, direct literacy score, indirect literac7 score (direct and indirect literacy scores were sub-scores from the home literacy questionnaire), daycare, and maternal education were compared to overall letter awareness and overall sound awareness changed in the experimental conditions for each group. The results are depicted in Table 6 below.

Table 6

Pearson Correlations for Independent Variables Compared to Letter and Sound Awareness Scores in the Experimental Phase for Both Groups

Exp. Scores	*PLS-4*	Age	# Rdg	HLQ	Dir Lit	Ind.Lit	Daycare	Mat Ed
Letter Awareness	-0.241	0 .093	-0.359	0.091	0.120	0.025	-0.372	-0.151
Sound Awareness	0.624*	0.358	0.203	0.458	0.508*	0.256	0.121	0.578*

*p < .05

The results of the regression analysis revealed a significant correlation to improved sound awareness scores only for direct literacy instruction at home, *PLS-4* scores, and maternal education.

In summary, the results from the statistical analyses supported some of the hypotheses formed from the initial research questions. The ANOVA revealed significant differences for time of measurement and child group by time of measurement interaction indicating that the intervention did produce gains in the experimental group, particularly in the area of sound awareness. Furthermore, these gains were maintained following a six week period with no explicit instruction. Significant increases were specifically documented with pointing to a letter on a PF card, selecting a letter on a PF card from a field of three, and producing the corresponding phoneme when shown a PF card. Finally, a overall language ability, level of maternal education, and direct literacy instruction at home were positively associated with improvements in sound awareness skills.

DISCUSSION

While phonological awareness and alphabet knowledge have been the focus of much discussion and research in emergent literacy, the extant literature on early childhood has explored the abilities of preschool and kindergarten aged children. This exploration is consistent with the current view that written language is a secondary ability that is learned by associating letters with already well formed phonemic representations in the child's language, thereby allowing for letter-sound correspondence to be learned through extended explicit instruction during later pre-kindergarten and kindergarten.(Bus & van Ijzendoorn, 1988; Justice & Ezell, 2000; Justice et al., 2001; Justice & Ezell, 2002). In this view, children would acquire written language skills fairly late in development and as a result of explicit teaching of letter and sound associations (van Kleeck, 1998; Stadler & McEvoy, 2003; Justice & Ezell, 2004).

This study explored the validity of these assumptions by examining the ability of 20-24 month old toddlers to learn to associate letters and letter sounds from a naturalistic book-reading experience. If toddlers were able to show emerging knowledge of letters and letter-sound associations from a relatively short period of book reading, the suggestion would be that this knowledge is capable of being learned earlier and more rapidly than current theories suggest. An alphabet format that provides an iconic representation of the relationship between letters and sounds, Phonic Faces, was used because the letter is drawn in the face of a character in a manner that gives clues to primary production features of the sound related to the phoneme in question. By making the association more obvious in the stimuli, it was proffered that toddlers would be able to understand and acquire the letter-sound relationship. The findings of this study

provide initial support for the early acquisition of letter and letter-sound abilities and some insights into the developmental and environmental factors involved.

Acquisition of Letter Awareness

Three of the measures of this study examined emerging letter awareness in toddlers. The first presented a series of five Phonic Faces cards (p,m,s,l,e) and prompted the subject to point to a named letter, which could be either in the face or printed on the corner of the card. This task was the most successful at pre-test and also at post-test. Subjects on average pointed to two letters at pre-test and nearly four of five at post-test. The second task presented a set of three Phonic Faces cards (two consonants and one vowel) and required subjects to point to a specific letter named. Subjects on average pointed to one correct letter at pre-test and nearly three at post-test. The third asked subjects to point to a named letter from a set of two printed letters and one number. Performance at pre-test was similar to task 2, with an average slightly greater than one correct, but showed fewer gains, averaging approximately two correct at post-test.

These findings reveal that by 20-24 months of age, toddlers already know something about letters and the alphabet. Prior to instruction, nearly all of the subjects were able to point to a letter, and some could identify a specific letter. The pre-test findings reveal that it is a general and emerging concept of a letter at this age, in that correct responses to "find any letter" were twice as high as finding a specific letter either in a Phonic Face or in print. The findings also suggest that the Phonic Faces may facilitate letter identification in that more correct responses were elicited with the Phonic Faces letters than the printed letters at pre-test with a statistically reliable increase at post-test for both tasks. Further, both groups showed greater gains following their respective intervention phases with exposure to Phonic Faces, and each intervention group made

greater gains than the controls, although not at a statistically reliable level. The failure to achieve significant differences was not because subjects failed to make gains in letter awareness following the Phonic Faces book reading, because both groups did make progress (Group E-C from five to nine and Group C-E from nearly four to eight of 15 possible responses from pre-test to post-test). However, the control group during Phase 1 also gained in letter awareness during the six weeks when the subjects were not engaged in the experimental book reading. This suggests that 20-24 month old toddlers are learning about letters and letter names from environmental sources, long before explicit instruction is provided and alphabet knowledge is expected.

Acquisition of Letter-Sound Awareness

Four measures of this study examined emerging letter-sound awareness. The first required the child to point to a letter, either in the mouth of a Phonic Faces character or the printed letter on the card when the examiner produced the associated sound. This task yielded the highest performance at pre-test (finding any letter) with an average of two correct responses, and the second highest performance at post-test with an average of three out of five correct responses. The second task required subjects to identify the specific letter associated with the sound produced by the examiner from a choice of three Phonic Faces cards (two consonants and one vowel). Subjects on average pointed to 1.75 correct letters at pre-test and 2.75 at post-test. The third task required identification of a specific printed letter associated with a sound produced by the examiner, which also yielded 1.75 correct responses at pre-test and showed no gains at post-test. The fourth task required subjects to produce a sound in response to a series of Phonic Faces cards. Correct responses at pre-test were negligible (0.13), but averaged two of five at post-test.

These findings reveal that by 20-24 months of age, toddlers are already aware that letters are important and point to them when adults produce sounds. This awareness may be facilitated by Phonic Faces, in that increases in performance at post-test occurred only for the two measures with Phonic Faces stimuli. Further, both groups showed greater gains following their respective intervention phases using Phonic Faces, and made minimal or no gains during control phases, a finding that was statistically significant.

In the first three sound awareness tasks, it is possible that subjects may have pointed to letters because they were salient on the stimulus cards, with no true understanding of the relationship between letters and sounds. Although gains were shown, none of the tasks showed a significant increase from pre-test to post-test. However, on the most difficult task, producing the correct sound when shown a Phonic Faces letter, significant increases were demonstrated. All subjects were unable to produce sounds in response to letters in the Phonic Faces mouth or in response to printed letters at pre-test, but were successful following their treatment phase. These findings indicate that toddlers are capable of understanding the relationship between letters and sounds, and that the iconic representation provided by the Phonic Faces facilitates and even improves upon this recognition.

Producing a sound in response to a Phonic Faces card was the most difficult task, requiring a production response while the other experimental tasks were receptive in nature and required only pointing responses. To produce the sound that corresponded to the letter within a Phonic Face picture, a child must be able to visually recognize the letter, discriminate that letter from other letters, and link the correct sound with the letter before production of the target phoneme category successfully occurs. That is to say, all of the other subtest skills measured in the study must be emerging in some manner for

higher proficiency to occur on the most difficult task. Therefore, if all of these skills are emerging simultaneously, although at different rates and in different orders across the children, then there will be a concomitant improvement in the overall test scores of the groups. This premise is consistent with the findings of this study.

In summary, the findings of this study suggest that 20-24 month old toddlers are capable of learning letter and letter-sound skills following 6 weeks of exposure, and in fact appear to be learning letter skills from daily environmental exposure that has previously been unreported in the literature. Even fairly sophisticated skills, such as producing a sound in response to a letter, are elicited after a relatively brief period of exposure to this concept in a naturalistic activity. The iconic representation provided by the Phonic Faces facilitates this learning, and appeared to be the primary source for acquiring letter-sound associations for this age group.

Maintaining Gains

Skills that are practiced or memorized may be quickly forgotten once rehearsal of the skill discontinues. Thus, it was important to determine if gains in letter and letter-sound awareness were maintained after the book reading intervention was discontinued. The group of toddlers who received treatment first was used to address this question since they had a period of six weeks following their intervention before post-testing. Results indicated that not only were letter skills retained, but that a slight increase was demonstrated, in particular for finding any letter on a Phonic Faces card. The difference scores from mid-test to post-test were not significant, verifying no loss in acquired skills. Similarly, difference scores from mid-test to post-test were not significant for the letter-sound awareness tasks, indicating that no loss in acquired skills occurred for these abilities.

The fact that these scores did not decrease without continued intervention is suggestive of permanent learning and perhaps even further mastery of the letters and phonemes that the children were exposed to in the study since they were "primed" to specific letters. Also, their awareness of concepts of print in general, and letters and phonemes in particular, was heightened through the alphabet book reading, and following the intervention the children may naturally be drawn to and/or more aware of letters in the environment.

There was some anecdotal support for this premise based on the children's behaviors during the reading intervention. For the first few reading sessions most of the children were very interested in the book due to its novelty, interesting pictures, and color, as well as the attention and interaction they received while reading. After one to two weeks of reading many of the children appeared less interested, in part because the book was no longer novel, but also because the letter and letter-sound concepts were still not understood, perhaps just outside of the zone of proximal development. With continued readings and exposures to the book, the children increased their attention and interest and began to point, label, imitate, and comment about the pictures and letters on the pages. This change is consistent with other research on repeated readings which show that with time and repeated exposures children gradually construct an increasingly more sophisticated understanding of the meaning and function of books (Bus & van Ijzendoorn, 1988, 1997; Senechal et al., 1995, van Kleeck, 1998; Justice et al., 2001; Justice & Ezell, 2004). In this study, the changes across time suggest that as the letters and letter-sounds were incorporated onto their existing knowledge of the words and pictures, the book became more relevant and interesting to the toddlers and they were able to internalize a growing awareness of letters and sounds.

Developmental and Environmental Factors

While the group data revealed that toddlers do increase letter and letter-sound awareness abilities following Phonic Faces book reading intervention, the level of awareness at pre-test and the gains at post-test varied widely across subjects. Scores at pre-test for the seven tasks ranged from zero to 17 out of a possible 35. Similarly, scores at post-test ranged from seven to 29, reflecting gains from -3 to +17 points. To determine which developmental and environmental factors might contribute to these individual differences, the individual gain scores were correlated with seven factors known to be related to literacy development in young children. Two of the factors were developmental, including chronological age in months and language ability. The other five factors were environmental, including the number of readings, literacy experiences at home and at daycare, and maternal education.

Of the seven factors analyzed, three had a significant correlation to sound awareness scores. These were *PLS-4* scores, maternal education, and direct literacy instruction at home as represented on the Home Literacy Questionnaire completed by the parents. None of the factors correlated with increased letter awareness skills. Using a linear regression comparing overall gain to the seven factors, the direct literacy interactions at home made the primary difference in the overall increase in scores from pre-test to post-test ($p < .041$). Information about the children's exposure to direct literacy activities was determined by parental report on the Home Literacy Questionnaire. Mothers and two fathers reported their child's experience with direct literacy tasks such as reading, writing, print-referencing, exposure to print, and exposure to books, and indirect literacy tasks including such activities as pretend play, talking about photos and pictures, and following directions. All of the parents of children with the highest direct

literacy scores (scores ≥ 50) reported that they observed their child holding a book and pretending to read while pointing and labeling, and watching educational television for preschoolers at least once a day. Most of the same parents also indicated that they pointed to print in the environment, the child pointed to print in the environment, the child pretended to read, and the child played with a letter-related toy (letter magnets, blocks, puzzles) at least once a day as well. These exposures to print, books, and letters in the environment had a positive effect on the early literacy development, especially letter knowledge which increased throughout the study whether or not the children were in the treatment group.

The relationship between direct literacy experience and letter/letter-sound awareness is consistent with previous research by Bus and van Ijzendoorn (1988, 1997), Senechal et al. (1995), Senechal et al. (1998), van Kleeck (1998), Justice and Ezell (2000), Justice et al. (2001), Lawhon and Cobb (2002), and Roberts et al. (2005). That body of research asserted that print-referencing behaviors during storybook reading, experience with touching and handling books, and shared book experiences can shape a child's emerging literacy skills.

While direct literacy experiences at home were important to letter and letter-sound knowledge, surprisingly this same effect was not obtained for literacy experiences at daycare. Even though almost all of the children in the study were at daycare for 40 or more hours per week, the literacy environment of the daycare did not have a significant impact on the children's ability to learn letters and letter-sounds. This is particularly noteworthy as there were striking differences in the both the direct and indirect literacy experiences of the two daycares who participated in the study. The "high literacy" daycare was based on the model of a developmentally-appropriate preschool, with play

centers, book reading areas and teacher-child interaction during play. Writing and art activities, toys with letters and words on them, songs, and story times were also included every day. In contrast, the "low literacy" daycare had no accessible picture books in the room, toys for imaginative play were limited, and there was no observed teacher-child interaction during play. The children had some limited exposure to writing and art implements, but the television in the room remained on throughout the day with children's programming and videos playing continuously. However, as long as the children were involved in literacy experiences at home, the daycare environment did not significantly impact growth in letter and phoneme knowledge in this particular study. A daycare for more impoverished children may have made a greater difference.

All of the children achieved a Total Language quotient score at the average to high-average range on the *PLS-4*, with a spread from 97 to 130. Three of the subjects scored in the average range, 10 in the above average range, and 3 in the superior range for receptive and expressive language. The three children who scored in the superior range did not have the highest scores at pre-test, and two made only moderate gains at post-test. Two of the children with average scores did have pre-test scores in the lower range, but the third had the highest pre-test score and also had one of the highest gain scores. The correlation between language skills and gains in letter-sound skills suggests that the emergent print awareness abilities are dependent on language development as the secondary ability model of written language would predict. This suggests that the two language domains are interacting as written language may be learned by associating letters with already well formed phonemic representations.

The number of interventions had no effect on gain scores. While a minimum of 15 readings was the target, due to absences and vacation, three of the children received

fewer than 15 reading sessions. The range of reading interventions was 11-17, with the three children only participating in the alphabet book experience 11, 12, and 14 times. However, regardless of the number of times the alphabet book was read there was no correlation between the readings and gain score. This may be attributed to the fact that there was only a five session discrepancy between the children who received the least and most reading experiences. This suggests that 11 sessions was sufficient for children to make basic discoveries about letters and letter-sounds from the book reading experiences, and 17 sessions was not sufficient for children to master these abilities. Future research is needed to determine if more intervention sessions will lead to changes, or if the skills are developmental and would require an extended period of maturity and experience to fully acquire.

Finally, gain scores were not related to age of the child. Since all of the children were at least 20 months old and no more than 24 months old at the beginning of the study, the age range was limited. This age range was targeted based on research that suggest that 18-20 months of age is a pivotal time in the development of book reading behaviors (Murphy, 1978; Bus and van Ijzendoorn, 1988, 1997; Senechal et al., 1995). Further research is needed to determine if children younger than 20 months are capable of acquiring letter and letter-sound skills, and whether there are stages where critical acquisitions appear when children have the exposure and interactions from the environment.

Although the range of maternal education levels was limited, it did correlate with increased sound awareness skills. All of the mothers had completed high school and had taken some college courses, with 75% of the mothers having at least a bachelor's degree, and several completing a graduate or professional degree. None of the families lived at or

below the poverty level. A more heterogeneous population may have yielded different results.

Practical and Theoretical Applications

Perhaps the most important and obvious theoretical implication gained from this study is that toddlers can learn to recognize and discriminate letters and letter-sounds, resulting in a culmination of those skills by producing the accurate phoneme when shown a letter. While there is extensive research in the areas of emergent literacy, almost all of the controlled scientific study has been with children who are older than three years of age, with the majority of research concentrating on three and four-years-olds. Since two-year-old children are in the midst of developing competence with spoken language, proficiency or even introduction to written language seems at least a couple of years in the future. However, the children in this study demonstrated that they are cognitively and linguistically ready and perhaps even primed, to learn about written language.

Although reading and writing are often thought of as secondary linguistic abilities requiring explicit instruction after achieving some level of competence with oral language, the results of this study lend some evidence for the argument that reading skills may be biologically determined as well, or at least that general cognitive mechanisms are equally capable of constructing knowledge of written language as oral language. It has been well documented that there are specific regions of the brain associated with or dedicated to reading (Dehaene, 2004; Sakai, 2005). In particular, Dehaene's (2004) research noted that the "visual word form area" (VWFA) of the brain was readily identifiable on any human, located in essentially the same area of the left occipito-temporal sulcus on each person, and appears to be functionally specialized for interpreting written words. This specialized neural area can make rapid accurate

judgments about words regardless of form (uppercase or lowercase), but becomes specialized to the native language.

Dehaene (2004) provided a specific example regarding how a young child learns to recognize letters. He suggested that children develop pre-existing representations from exposure, but these may not match with the actual or correct representation. For example, letters that are identical except for their spatial orientation (i.e., p, q, b, d) are neurologically generalized regardless of direction. While not crucial to object recognition, this invariance can result in confusion for children, so this low regard for spatial orientation that was innate must actually be unlearned or "recycled" during the development of reading skills.

An additional theoretical implication of these experimental results, that has practical application as well, is the finding that children learned the letters and letter-sounds through shared alphabet book reading. There were no flashcards and rote memory, merely scaffolded reading experiences with an alphabet book. The tone and dialogue of the reading sessions was very similar to the shared book experiences among mother-child dyads as described by Murphy (1978), Bus and van Ijzendoorn (1997), Senechal, Cornell, and Broda (1995), van Kleeck (1998), Justice, Weber, Ezell, and Bakeman (2001), and Stadler and McEvoy (2003). As the experimenter and child looked at each page the letters were pointed to and named, the associated sound tokens was produced and discussed, and references were made to the letter and its sound in relation to the other pictures and printed names on the page. With increased exposure to the book, the children began to participate more, which included pointing to letters and pictures, imitating letter names and sounds, and labeling pictures. As they pointed and verbalized

the examiner verbally responded and expanded their utterances, while asking occasional questions as well.

The results of this study can be readily applied to home, educational, and therapeutic environments. It has been well documented that reading to children before formal reading education begins lays a crucial foundation for reading success in the later elementary years (Snow, Burns, & Griffin, 1998). However, since the results of this study suggest that not only are children building a reading foundation, but beginning to develop discrete reading skills late in the second year of life, daily reading to toddlers becomes not only a nice idea, but significant. Since direct literacy experiences at home correlated strongly to overall gains in letter and sound awareness, early letter and phoneme awareness is warranted throughout the first two to three years of life.

Toddlers should be read to, see parents reading, have access to letter toys such as block, puzzles, and magnetic letters, and be presented with regular opportunities to scribble, color, and paint at home, at school, and in speech therapy or early intervention programs. Parents, educators, childcare providers, and speech-language pathologists working with toddlers and young preschoolers should reference print in the immediate environment and during shared book reading, making a point to name letters and produce associated sounds\ on occasion. Specific attention should also be given to reading alphabet books which naturally lend themselves to discussion and attention to print (Van Kleeck, 1998; Stadler & McEvoy, 2003). Also, when children do watch television it should be educational, age-appropriate, and viewing should occur as a scaffolded interaction with an adult (Bus & van Ijzendoorn, 1988).

Limitations of the Study

The greatest limitation of this study was the small sample size with high variability that does not allow for generalization to a larger population of toddlers. Even though the statistical analysis yielded significance between the two groups across testing conditions, Type II errors are possible due to the diminished sample size. Also, since the group tended to be linguistically precocious, as manifested by the high *PLS-4* scores, they may be an underlying power issues skewing the results.

Another limitation was the fact that only nine letters were presented in the alphabet and assessed during the pre-, mid-, and post-test experimental probes. Only nine letters were selected in the interest of time for reading and also because of the relatively short attention span of two-year-olds. Although they may have attended to an entire alphabet book, it would have been very difficult to devise a testing assessment that covered all seven tasks and included all 26 letters of the alphabet that was able to elicit enough joint attention for completion of the task. Furthermore, the representative phoneme was part of the letter name for all of the letters in the study (e.g., /em/ for "M," /pi/ for "P," /keI/ for "K") and it would have been interesting to know if it would have made a difference to use letters whose phonemes were not contained in the letter name (e.g., /waI/ for "Y," /dəblju/ for "W") as these letter name and phoneme correspondences tend to be more difficult for most older children.

A final limitation to this study was the brief assessment. Since there were seven separate subtests, there were only five test probes per subtest as a means of keeping the testing within the attention span of a two-year-old. Because of this small pool of stimuli there was a greater chance of guessing, particularly on the second and third Letter and Sound Awareness tasks where the child was asked to point to one picture from a field of

three. Also, since the sound production task was a key indicator of learning, it would have been preferable to have included all nine phonemes in that task instead of just five.

Suggestions for Further Research

The findings of this study elicit several directions for future research. First, investigations to assess other letters, including those with lower frequency use, poor iconic representations, and/or mismatched letter and letter-sounds, is needed to determine if the results from this study can be generalized to all letters. It is quite possible that the letters included in the current study produced better results because they were high frequency and iconically represented letters than have the phoneme embedded in the letter name.

It would also be interesting to see if these results could be replicated with a classroom treatment. The dynamics of one adult reading to a group of children are different than the adult-child reading dyad. A study developed to assess reading alphabet books to a classroom of toddlers as compared to the one-on-one reading experiences would provide additional insight. In a dyadic reading paradigm, the adult can follow the child's lead, respond to questions, and expand or scaffold the child's comments. In a classroom setting with multiple children, these patterns of interaction are not always possible. However, there is the additional possibility of peer teaching. That is, toddlers learning from a classmate's questions and comments about the book.

Future research could also explore whether or not the same results could be achieved with any alphabet book, which naturally increases attention to form as opposed to content, or if it the highly iconic and contextualized nature of the Phonic Faces alphabet book made the difference. Having three groups such as a control group, a PF alphabet book group, and a standard alphabet book group with alternating treatments

would create an interesting mix and help tease apart the influence of context with regard to alphabet letters. Research utilizing wider and more varied ages of children, children from different socioeconomic backgrounds, and children with disordered speech and language skills would be additional considerations.

REFERENCES

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

Beaton, A.A. (2004). *Dyslexia, Reading, and the Brain: A Sourcebook of Psychological and Biological Research*. Psychology Press, Hove, UK.

Brookes H, Slater A, Quinn P. C., Lewkowicz D. J., Hayes R, & Brown E. (2001). Three-month-old infants learn arbitrary auditory-visual pairings between voices and faces. *Infant and Child Development. 10*, 75-82.

Bus, A. G., & Van Ijzendoorn, M. H. (1997). Affective dimension of mother-infant picture book reading. *Journal of School Psychology, 35,* 47-60.

Bus, A. G. & Van Ijzendoorn, M. H. (1988). Mother-children interactions, attachment, and emergent literacy: A cross-sectional study. *Child Development, 39,* 1262-1272.

Chomsky, N. (2002). *On Nature and Language*. Cambridge, UK: Cambridge Univ. Press.

Dehaene, S., (2004). Evolution of human cortical circuits for reading and arithmetic: the "neuronal recycling" hypothesis. In Dehaene, S., Duhamel, J. R., Hauser, M., & Rizzolatti, G. (Eds.), *From Monkey Brain to Human Brain.* Cambridge, Massachusetts: MIT Press.

Dehaene-Lambertz, G. & Gliga, T. (2004). Common neural basis for phoneme processing in infants and adults. *Journal of Cognitive Neuroscience, 16,* 1375-1387.

DeLoache, J. S. (2003). Becoming symbol-minded. *Trends in Cognitive Science, 8*, 66-70.

DeLoache, J. S., Pierroutsakos, S. L., Uttal, D. H., Rosengren, K. S., & Gottlieb, A. (1998). Grasping the nature of pictures. *Psychological Science, 9*, 205-211.

Gunn, B. K., Simmons, D. C., & Kameenui, E. J. (1995). Emergent literacy: Synthesis of the research. *National Center to Improve the Tools of Educators.* Retrieved October 17, 2006 from http://idea.uoregon.edu/~ncite/documents/Techrep/tech19.html.

Jensen, E. (1998) *Teaching with the brain in mind.* Alexandria, VA: Association for Supervision and Curriculum Development.

Justice, L. M., & Ezell, H. L. (2001). Enhancing children's print and word awareness through home-based parent intervention. *American Journal of Speech-Language Pathology, 9*, 257-269.

Justice, L. M., & Ezell, H. L. (2002). Use of storybook reading to increase print awareness in at-risk children. *American Journal of Speech-Language Pathology, 11,* 17-29.

Justice, L. M., & Ezell, H. L. (2004). Print referencing: An emergent literacy enhancement strategy and its clinical applications. *Language, Speech, and Hearing Services in Schools, 35,* 185-193.

Justice, L. M., Weber, S. E., Ezell, H. K., & Bakeman, R. (2001). A sequential analysis of children's responsiveness to parental print references during shared book-reading interactions. *American Journal of Speech-Language Pathology, 11,* 30-40.

Kuhl, P. K. & Meltzoff, A. N, (1996). Infant vocalizations in response to speech" Vocal imitation and developmental change. *Journal of the Acoustical Society of America, 100*, 2425-2438.

Kuhl, P. K. & Williams, K. A. (1992). Linguistic experience alters phonetic perception in infants by 6 months of age. *Science, 255*, 606-608.

Lawhon, T. & Cobb, J. B. (2002). Routines that build emergent literacy skills in infants, toddlers, and preschoolers. *Early Childhood Education Journal, 30*, 113-118.

Lombard, M., Snyder-Duch, J., & Bracken, C.C. (2005). Practical resources for assessing and reporting intercoder reliability in content analysis research projects. Retrieved September 29, 2007 from http://www.temple.edu/sct/mmc/reliability/.

Marsh, J. (2003). One-way traffic? Connections between literacy practices at home and in the nursery. *British Educational Research Journal, 29,* 369-382.

Murphy, C. M. (1978). Pointing in the context of a shared activity. *Child Development, 49,* 371-380.

Neuman S. B., & Roskos, K. (1993). Access to print for children of poverty: Differential effects of adult mediation and literacy-enriched play settings on environmental and functional print tasks. *American Educational Research Journal, 30,* 95-122.

Petitto, L. A., Holowka, S., Sergio, L. E., Levy, B., & Ostry, D. J. (2004). Baby hands that move to the rhythm of language: Hearing babies acquiring sign language babble silently on the hands. *Cognition, 93*, 43-73.

Preissler, M. A. & Carey, S. (2004). Do both pictures and words function as symbols for 18- and 24-month-old children? *Journal of Cognition and Development, 5,* 185-212.

Roberts, J., Jurgens, J., & Burchinal, M. (2005). The role of home literacy practices in preschool children's language and emergent literacy skills. *Journal of Speech, Language, and Hearing Research, 48*, 345-359.

Sakai, K. L. (2005), Neuroscience: On language acquisition and brain development. *Science*, *310*, 815-819.

Senechal, M., Cornell, E. H., & Broda, L. S. (1995). Age-related differences in the organization of parent-infant interactions during picture-book reading. *Early Childhood Research Quarterly, 10, 317-337.*

Senechal, M., LeFevre, J., Thomas, E. M., & Daley, K. D. (1998). Differential effects of home literacy experiences on the development of oral and written language. *Reading Research Quarterly, 33,* 96-116.

Shore, R. (1997). *Rethinking the brain: New insights into early development.* New York: Families and Work Institute.

Slater A, & Quinn P. C. (2001). Face recognition in the newborn infant. *Infant and Child Development,* 10, 21-24.

Smith, E. F. (1999). *The performance of prekindergarten children on representational tasks across levels of displacement.* Unpublished doctoral dissertation, Louisiana State University, Baton Rouge, Louisiana.

Snow, C.E., Burns, M.S., and Griffin, P. (Eds.) (1998*). Preventing Reading Difficulties in Young Children*. Report of the Committee on the Prevention of Reading Difficulties in Young Children, The National Academy of Sciences.

Stadler, M. A., & McEvoy, M. A. (2003). The effect of text genre on parent use of joint book reading strategies to promote phonological awareness. *Early Childhood Research Quarterly, 18,* 502-512.

Van Kleeck, A. (1998). Preliteracy domains and stages: Laying the foundations for beginning reading. *Journal of Children's Communication Development, 20*, 33-51.

Vygotsky, L. (1978). *Mind in society.* (A. Cole, V. John-Steiner, S. Scribern, & E. Souberman, Eds.). Cambridge, MA: Harvard University Press. (Original work published 1930).

Vygotsky, L. (1986). *Thought and language.* (A. Kozulin, Ed.). Cambridge, MA: MIT Press. (Original work published 1934).

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development, 69,* 848-872.

APPENDIX A

PARENT CONSENT FOR PARTICIPATION

Project Title: Alphabetic and Phonemic Awareness in Toddlers and Preschoolers

Performance site: Daycare centers and Mothers' Day Out programs in Baton Rouge, LA; LSU Speech and Hearing Clinic

Investigators: (available by phone or email)

Monday-Friday 8:00 am-4:30 pm
Jan Norris, Ph.D. -- 578-3936; jnorris@lsu.edu
Pam Terrell, M.S., CCC-SLP—924-8700 x3272;
pamela.terrell@gmail.com

Purpose of the Study: This study will investigate what young children learn from picture cards showing drawings of faces. Each face will emphasize a different concept. We want to know if 18-36 month old children will show evidence of recognizing these concepts after 6 weeks.

Inclusion Criteria: Mother-child pairs with the children being between 18-36 months old.

Exclusion Criteria: Children with sensory loss or cognitive delays.

Description of Study: At the beginning of the study, we will videotape your child who will be sitting on your lap or the lap of a familiar caregiver from the center completing tasks such as finding a picture from a choice of 3, pointing to a body part and so forth. This will be done at your child's day care center. You will then be given a small picture book with 9 pages, and will be shown how to talk about the picture book with your child. You must agree to "read" this book in the manner demonstrated 2-3 times per day for six weeks and to keep a record of how many times the book was read. At the end of the six weeks, we will again videotape your child completing the tasks.

Benefits: Book reading is an enjoyable activity for young children, and they like to look at pictures of faces. We may find that children are learning more from these experiences than previously thought. You will help us to know more about how young children learn, and your child may learn some new concepts.

Risks: There are no known risks.

Right to refuse: You may choose not to participate or to withdraw from the study at any time without penalty.

PARENTAL PERMISSION FORM, p. 2

Privacy: Results of the study may be published, but no names or identifying information will be included in the publication. Subject identity will remain confidential unless disclosure is required by law.

Financial information: There is no cost for participation in the study, nor is there any compensation to the subjects for participation.

Signatures: The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigator. If I have questions about subjects' rights or other concerns, I can contact Robert C. Mathews, Chairman, Institutional Review Board, (225) 578-8692. I will allow my child to participate in the study described above and acknowledge the investigator's obligation to provide me with a signed copy of this consent form.

Parent's Signature Date

The parent/guardian has indicated to me that he/she is unable to read. I certify that I have read this consent from to the parent/guardian and explained that by completing the signature line above he/she has given permission for the child to participate in the study.

Signature of Reader Date

APPENDIX B

CASE HISTORY FORM

Child's Name_____ DOB_____ Age_____
Parents' Names_____ Home phone_____
Address_____
Cell phone_____ Work phone_____
Email address_____

Social history:
Family members living in the home_____
How often and for what length of time you're your child attend daycare?_____
Name of daycare_____
Mother's education level: How many years of education? (Please circle)
Some high school Graduated high school Some college
Graduated College Some graduate work Completed graduate degree

Birth/medical history:
Pregnancy: ____Uncomplicated _____Complicated. Please explain: _____
_____
Delivery: _____Vaginal _____C-section. Please explain any complications _____
_____
Birth weight_____ Did your child have any problems following delivery such as feeding difficulties, poor oxygenation, poor muscle tone, etc? ___yes ___no
If yes, please explain_____
Was your child in the NICU following delivery? _____yes _____no. If yes, please explain _____
Does your child have a history of frequent ear infections? _____yes _____no
Has your child had tubes placed in his/her ears? _____yes _____no. If so, when?_____
Has your child's hearing been tested? _____yes _____no. Results?_____
Does your child have any other extenuating medical conditions or history of surgeries?
_____
_____

Developmental History:
Please write in the approximated ages that the following milestones were achieved:
_____sitting up _____crawling
_____pulling up _____walking
_____babbling (i.e., mamamama) _____first words
_____putting 2 words together

Is there a family history of any speech, language, reading, writing, attentional, or learning disabilities? _____yes _____no
If yes, please explain_____
Do you have any concerns about your child's development? _____yes _____no
If yes, please explain_____

APPENDIX C

HOME LITERACY EXPERIENCE QUESTIONNAIRE

1. Direct: About how often does your child scribble with crayons, markers, chalk, pens, or pencils?

2. Indirect: About how often does your child use objects appropriately during pretend play like using a spoon to stir or eat pretend food, brushing a stuffed animal's hair, etc.?

3. Unscored: About how often does your child ask to eat fruit? What fruits does he/she like most?

4. Direct: About how often does your child ask to have a favorite book read? What is the title of the book?

5. Direct: About how often does your child specifically point to print either in the environment (such as billboards, labels, mail, etc.) or in books?

6. Indirect: About how often do you talk with your child about something that he/she did earlier in the week?

7. Indirect: About how often do you talk with your child about differences between animals such as the different noises they make, different skin coverings (fur, feathers, scales), and different environments (farm, zoo, water)?

8. Indirect: About how often does your child pretend to be someone else like an animal or a baby?

9. Indirect: When watching TV or DVDs, about how often do you add additional comments and explanations to help your child understand more?

10. Direct: About how often do you notice your child holding a book and turning the pages as if reading?

11. Indirect: About how often is your child able to follow 2-part directions such as: *Pick up the napkin and put it in the trash?*

12. Direct: About how often does your child point to things in the environment and provide a verbal label such as pointing to a truck and saying "truck"?

13. Indirect: About how often does your child attempt to sing along with music or television shows?

14. Direct: About how often does your child point to letters in books or on signs in the community?

15. Indirect: About how often do you talk to your child when putting away groceries or laundry telling him/her where different categories of food or clothing belong?

16. Direct: About how often does your child ask to see a particular children's DVD? Name of DVD?

17. Indirect: About how often does your child regularly follow requests with two parts such as: *Get the spoon and put it on the table.*

18. Direct: About how often does your child watch TV shows for preschoolers such as *Barney, Sesame Street, TeleTubbies, Dora the Explorer*, etc?

19. Direct: About how often does your child use children's software on a computer, play simple computer games, and/or pretend to type on a computer?

20. Unscored: About how often does your child ask for a favorite food? What is this favorite food?

21. Direct: About how often does your child ask you to draw a picture?

22. Indirect: About how often do you describe to your child what you are doing when you are cooking or preparing food?

23. Unscored: About how often would your child need to be disciplined? What sort of discipline have you most recently used?

24. Indirect: About how often does your child sing along with the radio in the car or while watching singers on television?

25. Direct: About how often do you point out and read road signs or signs on buildings or walls when you are driving, shopping, or walking with your child? What sign have you most recently pointed out to your child?

26. Indirect: About how often do you and your child look at pictures of him/her and you talk to him/her about what was happening and where she/he was when the picture was taken?

27. Unscored: About how often does your child attempt to dress himself/herself?

28. Direct: About how often do you go to a library for children's books or get a new children's book in the store or through a book club? What is the title of the most recent book your child has received from either the library, a store, or book club?

29. Direct: About how often does your child seem to be interested in having storybooks read to him/her?

30. Indirect: About how often do you ask your child to bring a certain package to you such as a certain brand of cereal or soft drink where she/he would have to recognize the correct label to be able to get the right package?

31. Direct: About how often does your child play with alphabet toys at homes such as an alphabet puzzle, plastic magnetic letter, or blocks with letters at home? What type of alphabet toys does you child have at home?

32. Direct: About how often does you child see computers being used or actually use a computer?

33. Indirect: About how often does your child ask you to pretend play with her/him?

34. Direct: About how often does your child make believe that he/she is reading something with print on it such as a sign, newspaper, magazine, or book?

35. About how many storybooks would you estimate to be in your home right now? _____ What are the titles of some of these books?

*Note: On the form given to the parents to complete, there was no notation of "indirect, direct, unscored."

APPENDIX D

HOME LITERACY EXPERIENCE SCORE SHEET

ID #_____ Informant's relationship to child_____

Question	Direct Literacy							Indirect Literacy						
	N	M	W	W+	D	D+		N	M	W	W+	D	D+	
1. D														
2. I														
3. U														
4. D														
5. D														
6. I														
7. I														
8. I														
9. I														
10. D														
11. I														
12. D														
13. I														
14. D														
15. I														
16. D														
17. I														
18. D														
19. D														
20. U														
21. D														
22. I														
23. U														
24. I														
25. D														
26. I														
27. U														
28. D														
29. D														
30. I														
31. D														
32. D														
33. I														
34. D														
Column Totals							Dir. score							Indir score
	__x0	__x1	__x2	__x3	__x4	__x5		__x0	__x1	__x2	__x3	__x4	__x5	

About how many children's storybooks do you have in your home right now?
Can name 3 titles? Yes No

Reliability check

Direct:	Indirect:
1. 4 & 28	1. 8 & 32
2. 19 & 31	2. 11 & 17
3. 10 & 33	3. 13 & 24

APPENDIX E

TESTING SCORE SHEET

Name_____

Date of Pre- Mid- Post-Test_____

Letter Awareness Tasks:

1) Finding Letters
Materials: Phonic Faces cards (P,M, S, L, E)
Directions: Show me the letter "p." Point to "p."

- P letter mouth face
- M letter mouth face
- S letter mouth face
- L letter mouth face
- E letter mouth face

2) Identifying Letters
Materials: series of PF cards
Directions: Point to "p." Show me the letter "p."

- Point to O (S O M) letter mouth
- Point to B (B E M) letter mouth
- Point to T (E P T) letter mouth
- Point to P (P S O) letter mouth
- Point to K (O K T) letter mouth

3) Discriminating Letters
Materials: series of letters and numbers
Directions: Point to "p." Show me the letter "p."

- Point to m (o m 2)
- Point to S (3 e S)
- Point to K (K 8 P)
- Point to b (b L 7)
- Point to T (m 4 T)

Sound Awareness Tasks

1) Sound/Letter Correspondence
Materials: PF Cards (K, O, B, T, M)
Directions: Point to /k/. Show me /k/.

- K letter mouth face
- O letter mouth face
- B letter mouth face
- T letter mouth face
- M letter mouth face

2) Identifying Sounds
Materials: Series of PF Cards
Directions: Point to /k/. Show me /k/.

- /oU/ (P S O) letter mouth
- /s/ (S O M) letter mouth
- /i/ (E P T) letter mouth
- /k/ (O K T) letter mouth
- /m/ (B E M) letter mouth

3) Discriminating Sounds
Materials: Series of letters and numbers
Directions: Point to /k/. Show me /k/.

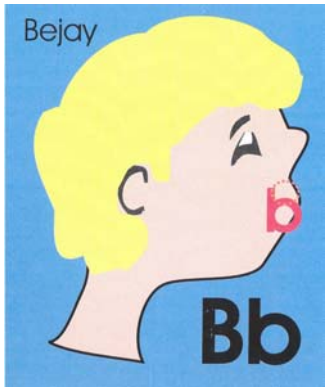
- /l/ (b L 7)
- /oU/ (o m 2)
- /s/ (3 e S)
- /t/ (m 4 T)
- /k/ (K 8 P)

4) Producing Sounds
Materials: PF Cards (S. K. M. O. B)
Directions: Point to letter and say, "What does he/she say?" and phonetically transcribe response

- S
- K
- M
- O
- B

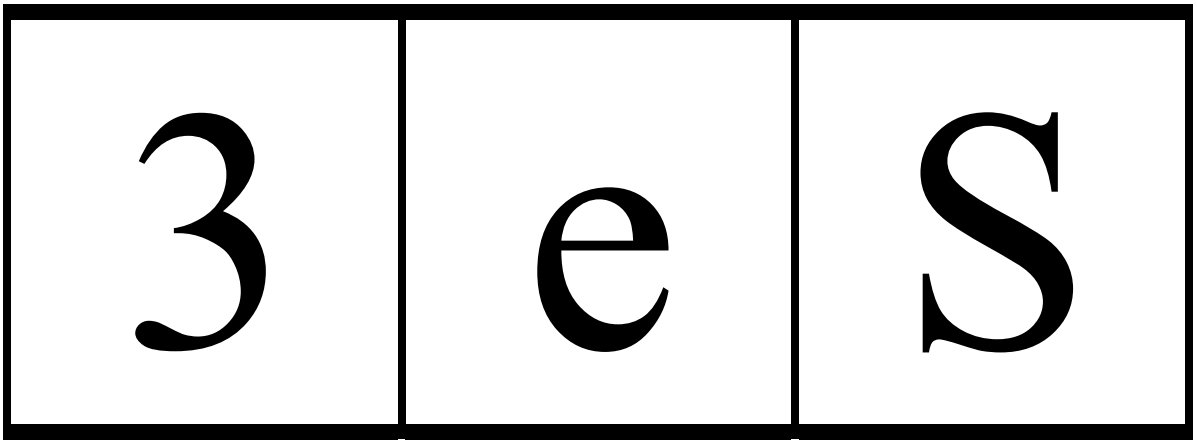
APPENDIX F

EXAMPLE TEST PROMPTS



Sample item for the find the letter, identify sound-letter correspondence, and producing sounds subtests

Sample item for the identifying letters and identifying sounds subtests



Sample item for the discriminating letters and discriminating sounds subtests

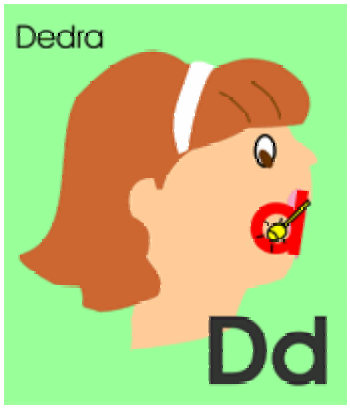
APPENDIX G

FOLLOW-UP LETTER TO PARENTS

Dear Parents,

I am please to report that the study your children participated in was a great success! I really enjoyed working with your children and it was a joy to watch them learn.

First of all let me explain the study in a nutshell…
1. I pre-tested your child using 35 experimental probes that I designed to test for letter and letter-sound knowledge. They were shown a Phonic Faces (PF) card like the one below and asked to point either to the letter "D" or the sound "duh."



2. Then they were shown a series of 3 different PF cards and asked to point to the letter or letter-sound that I said. The next task was a series of 2 letters and a number (just the letter, no PF) and they were requested to point to a letter or letter-sound. For the final task they were shown individual PF cards and asked "What sound does she/he make?" to see if they could produce the correct sound just by looking at the card.

3. The purpose of this experiment was to see if children as young as 20-24 months can begin to learn these alphabet concepts just through book reading and no explicit instruction. The current literature just addresses children ages 3 years and older, so we don't really know what younger children are learning about letters and sounds through book experiences.

4. Your child was randomly places in either an experimental group or a control group. I read an alphabet book featuring the PF cards and the letters "K, S, L, E, O, P, B, M, T" only. I read this same book to the children in the experimental group individually 3 times per week. I just played with the children (blocks, Potato Head, ball) in the control group. At the end of 6 weeks I gave all of the children the same test and then the groups switched. The experimental group became the control group (now no reading, just playing) and the control group became the experimental group (reading 3x/wk).

You can see the results on the excel chart in a separate attachment. The blue line indicates the experimental first-control second group and the pink line indicates the group that was control then experimental. You can see how the groups perform similarly on the pre-test (1), but the control group who is receiving no book reading does worse when tested again (2), but the experimental group makes great improvements in learning letters and sounds (2). As the groups switch, the pink group is now experimental and they begin to make significant gains and the blue control group still continues to add to what they have already learned about letters.

This indicates that just by reading an alphabet books and pointing out letters and the sounds they make very casually as we read, your children did learn to recognize letters and associate correct sound with the letter. This is a crucial skill that lays the foundation for reading in kindergarten. Also, regarding the home literacy questionnaire that you all filled out--- there was a statistically significant correlation between those who engage in a lot of literacy activities at home (letting your child scribble, reading daily, pointing to print in books, having books in the house, going to the library, etc.) and how your child performed in the study. The more that literacy and book activities were part of your child's daily life in the home, the better your child performed.

So, what does this mean? It ***doesn't*** mean that you should get alphabet flashcards and drill your child. It ***does*** mean that you should:

- Read daily, esp. as part of a bedtime routine
- Let your child see you reading (mail, newspaper, magazines, books, recipes)
- Point out print and letters occasionally as you read and talk about them ("Look! That's a "B" like in your name. It makes the "b" sound like "ball" and "baby.")
- Have toys with letters accessible to your child such as magnetic letters on the frig, letter puzzles, blocks (LeapPad-type toys are not a substitute for the real human interaction and language building that goes on when you interact with your child)
- Allow your child opportunities to paint, color, and "draw"
- When your child watches educational TV, sit down with him/her and talk about what is happening on the screen.
- Point out print in the environment. Very young children can start recognizing logos (like the golden arches) and that is a pre-reading skill as well.

Please contact me at pamela.terrell@gmail.com or (715) 346-3423 if you have any questions. Thank you again for allowing your child to participate!

Sincerely,

Pamela A. Terrell, M.S., CCC-SLP

VITA

Pamela Terrell is currently an instructor in the Department of Communicative Disorders at the University of Wisconsin-Stevens Point. She teaches undergraduate and graduate courses in the areas of preschool language disorders, counseling, clinical methods, and early intervention. She has traveled to Nicaragua and Honduras as a speech-language pathology volunteer with Operation Smile and has recently served as a member of the Healthcare Services Committee of the Louisiana Speech Language and Hearing Association. Pamela's past professional experience includes clinical practice as a speech-language pathologist in skilled nursing facilities, schools, hospitals, home health, and private practice. Most recently she worked at a pediatric outpatient clinic where she developed Camp ABC, an interdisciplinary camp for preschoolers at risk for reading and writing impairments, and TEAM Readers, a program for elementary-aged children with reading disorders. She has also previously served as an adjunct instructor at Missouri Southern State College (now University). The degree of Doctor of Philosophy will be awarded to Pamela Terrell on December 21, 2007.