EXPLORATION OF READING INTEREST AND EMERGENT LITERACY SKILLS OF CHILDREN WITH DOWN SYNDROME

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This study examined the reading interest and emergent literacy skills of 31 children with Down syndrome (DS) ages 7 to 13. Parents completed questionnaires on their children's interest in reading, home literacy environments, and parental beliefs about reading. Children were then assessed on their cognitive and emergent literacy skills. Correlational analyses revealed that parental beliefs related to children's receptive vocabulary and comprehension, especially when parents reported asking questions during book reading, encouraging children to ask questions and help tell the story, and guiding them to learn lessons and life skills from books. Home literacy environments predicted children's interest in reading, and children's mental age predicted their emergent literacy skills. A mental age of 3.50 years appears necessary (but not sufficient) for children with DS to achieve beginning literacy skills.

In this age of emphasis on reading as a key to academic and life success, growing evidence shows that home literacy environments and parental beliefs about reading positively influence children's emergent literacy skills. Parents of children with Down syndrome (DS), in particular, increasingly advocate for language and reading interventions for this population as well (Fidler, Lawson, & Hodapp, 2003). Indeed, research suggests that such efforts are worthwhile, with some individuals with DS eventually attaining functional levels of literacy and achieving better than expected performance in reading (Byrne, Buckley, MacDonald, & Bird, 1995; Byrne, MacDonald, & Buckley, 2002; Laws, Buckley, Bird, MacDonald, & Broadley, 1995). However, we still cannot tell exactly how and why some children with DS – but not all – become readers. Relatively little is known about these children's home literacy environments and their parents' beliefs about literacy. The present study then provides insight into how parents can facilitate the development of emergent literacy skills and interest in reading in their children with DS.

Beginning early in a child's life and prior to formal schooling, emergent literacy encompasses learning about reading, writing, and print – skills that eventually develop into conventional literacy (Gunn, Simmons, & Kameenui, 1998; Lonigan, Burgess, & Anthony, 2000; Sulzby & Teale, 1991). Emergent literacy consists of several components: receptive vocabulary, awareness of print conventions, knowledge of letters and sounds, phonological awareness, and emergent reading (van Kleeck, 1990; Whitehurst & Lonigan, 1998). Receptive vocabulary is critical in the earliest stages of literacy acquisition. Since the act of reading involves mapping visual forms (e.g. words) onto meaningful language, children can benefit from having a semantic representation of a word before they read it. Second, awareness of print refers to knowledge of the purpose, uses, and conventions of print (Clay, 1985). For example, children who demonstrate awareness of print understand that the printed words on a page rather than the pictures convey meaning that text begins from left to right starting at the top of a page and that periods mark the end of sentences (Whitehurst & Lonigan, 1998).

Yet another aspect of emergent literacy, knowledge of letters and sounds involves naming letters of the alphabet and recognizing their related sounds. In alphabetically based writing systems such as English, reading involves translating the units of print (i.e. letters of the alphabet) into units of sound, thus making letter knowledge a strong predictor of later success in reading (Ehri & Sweet, 1991; Johnston, Anderson, & Holligan, 1996). Similarly, phonological awareness involves the ability to detect and manipulate the sound units, or phonemes, of words – a skill that is also critical to reading in an alphabetic system (Gunn

et al., 1998; Mason & Allen, 1986; Treiman, 2000). Without adequate phonological awareness, children often have difficulty in decoding unfamiliar words (Yopp, 1985). Yet another component, emergent reading is the ability to read words by sight and derive meaning from print. Emergent reading involves the act of deriving meaning from print within its context, such as reading labels, signs, or logos (Whitehurst & Lonigan, 1998).

The home literacy environment has been shown to facilitate the development of these emergent literacy skills in typically developing children (Baker & Scher, 2002; Bus, van IJzendoorn, & Pellegrini, 1995; DeTemple, 2001; Senechal & LeFevre, 2002; Storch & Whitehurst, 2001). The home literacy environment is typically defined as the frequency and nature of literacy-related activities in the home, most notably shared parent-child book reading. In addition, the age of onset of parent-child book reading, the number of books in the home, the frequency of trips to the library, and the frequency and enjoyment of reading by the primary caregiver are also considered aspects of the home literacy environment (Payne, Whitehurst, & Angell, 1994).

Children's knowledge about print, strategies for reading, and interest in reading are affected by these early home experiences with print (Baker & Scher, 2002; DeTemple, 2001; Gunn et al., 1998; Payne et al., 1994; Senechal & LeFevre, 2002). In their meta-analysis examining the influence of joint reading on children's literacy skills, Bus and colleagues (1995) found that parent-child storybook reading accounts for up to 8% of the variance in the language growth, emergent literacy, and reading achievement of typical children. In another study, the home literacy environment accounted for approximately 40% of the variance in preschool children's vocabulary and conceptual/story knowledge, which in turn exerted a strong influence (41% of the variance) on children's phonological awareness and letter knowledge (Storch & Whitehurst, 2001). In particular, a teaching focus in the home – as defined by the frequency of teaching children to read and print words – is related to acquisition of phonemic awareness, letter knowledge, and vocabulary (Foy & Mann, 2003). Furthermore, family context variables – such as parental attitude toward education, parental aspirations for the child, and conversations in the home – seem to influence the development of emergent literacy skills in typically developing children (van Kleeck, 1990).

To date, only a few studies have explored the home literacy environments of children with DS. In one study, the homes of three preschoolers with DS were found to be print rich (Fitzgerald, Roberts, Pierce, & Schuele, 1995). However, there was little variety in the type of literacy activities, with almost all of the literacy time spent in reading storybooks. In another study – a web-based survey of 107 parents of children with DS – more than 70% of respondents reported having 50 or more children's books as well as other literacy materials in their homes (Al Otaiba, Lewis, & Whalon, 2009). Most parents in the study reported reading to their children and using literacy materials for 10 to 30 minutes per day. However, Trenholm and Mirenda (2006) found that relatively few of their 224 Canadian respondents who read storybooks to their children reported asking higher-level questions. Although these studies provide insight into the home literacy experiences of children with DS, they did not directly measure children's emergent literacy skills.

Children with DS can indeed learn to read. Although there is a range of reading achievement among individuals with DS, as many as half of children and adolescents with DS have been found to read at least 50 words (Buckley, Bird, & Byrne, 1996; Buckley & Sacks, 1987). Given good early reading instruction, some children with DS can attain reading levels above that which is expected for their developmental age. Previous studies have shown that children with DS can read at levels that are not only comparable to the reading abilities of typically developing children, but are also more advanced than their own cognitive abilities (Byrne, Buckley, MacDonald, & Bird, 1995; Byrne, MacDonald, & Buckley, 2002). Comparing 24 children with DS (ages 4 to 12 years) to a group of same-aged typical peers, researchers have found that children with DS had uneven cognitive profiles, with relatively advanced reading skills.

Given that the home literacy environment relates to the emergent literacy skills of typical children and that at least some children with DS can eventually attain functional levels of literacy or higher, it is important to investigate the relationship of the home literacy environment, parental beliefs about reading, and the emergent literacy skills and reading interest among children with DS. The present study explored the correlates of emergent literacy skills and reading interest in children with DS, attempting to explain why some, but not all, children with DS eventually learn to read. Specifically, this study attempted to

answer the following questions: 1) What is the relationship between the home literacy environment and the emergent literacy skills and interest in reading of children with DS?; 2) What is the relationship between parental beliefs about reading and the emergent literacy skills and interest in reading of children with DS?; 3) How does children's interest in reading relate to their emergent literacy skills?; and 4) Is there a necessary mental age for children with DS to achieve beginning literacy skills?

Method

Participants

The participants in this study were 31 school-age children with DS (aged 7-13 years) and their parents. All children were diagnosed with trisomy 21. As shown in Table 1, the children's mean chronological age was 10.48 years, and their mean mental age was 4.22 years, based on median age-equivalent scores on the Stanford-Binet IV Intelligence Test (Thorndike, Hagen, & Sattler, 1986). The group consisted of the roughly the same number of boys and girls. All children spoke English as their primary language. More than half of the children were first-born and of Caucasian background. Of the remaining children, nine were Hispanic and one was Asian. The mothers of these children were mostly married, in their late 30s to mid-40s, and had at least some college education. Most families in this study had household incomes above $50,000.

Table 1. Characteristics of children with DS (*N* = 31)

Age (years) (mean±SD)	10.48 (1.62)
Gender (males:females)	16:15
Mental Age (SB-IV median AE) (mean±SD)	4.22 (1.06)
Primary Language (English:Other)	31:0
Number of siblings (mean±SD)	1.84 (1.27)
Birth order	1st 17 2nd 4 3rd 5 4th 3 5th or more 2
Ethnicity	Caucasian 18 Hispanic 9 Asian 1 Mixed 3
Mother Age (mean±SD)	41.77 (5.23)
Mother Education (mean±SD)	15.03 (1.97)
Mother Hrs worked (mean±SD)	17.98 (17.92)
Income level	< $50k 8 $50k-$100k 10 > $100k 13
Marital Status of parents	Married 27 Divorced 2 Stepfather 2

Procedures

Approval to conduct research with human subjects was obtained from the Institutional Review Board at the University of California, Los Angeles. The author attended meetings of support groups for parents of children with DS in the greater Los Angeles area, distributing flyers about the study and making announcements requesting the voluntary participation of parents of school-age children with DS. Parents who expressed interest in participating in the study signed consent forms and provided their contact information. Once agreeing to participate in the study, all parents were mailed a packet of questionnaires inquiring about home literacy practices, parental beliefs about reading, children's interest in reading, and other family characteristics. The parents completed and returned the questionnaires to the author by mail or in person. Parents reported that the questionnaires took approximately 30 to 45 minutes to complete.

In the next phase of this study, parents brought their children to the university for a testing session. At this appointment, the children were asked for their assent to participate in the study in the presence of their parents. Upon obtaining the children's assent, the author tested the children on their cognitive functioning, receptive vocabulary, phonological awareness, alphabet knowledge, familiarity with print

conventions, and ability to comprehend meaning from written text. The testing session lasted approximately 45 minutes to one hour.

Measures of home literacy environment and parental beliefs about reading

Home Literacy Environment Questionnaire. This questionnaire contains 18 items measuring children's exposure to reading, the availability of print materials in the home, children's exposure to outside, literacy-related activities, as well as other home activities that foster language and literacy development. The items were scored on a 5-point scale (1 = never; 5 = everyday). The scores on the 18 items were then added together to create the total home literacy score, with a higher score indicating a more literacy-rich home environment. Created for the current study, this questionnaire was based on previous studies examining home literacy environments of young typically developing children (DeBaryshe, 1995; DeTemple, 2001; Griffin & Morrison, 1997; Storch & Whitehurst, 2001). For the sample of children with DS in the present study, Cronbach's alpha for the 18 items of the Home Literacy Environment Questionnaire equaled .72.

Items on the questionnaire included the following: How often do you (or another adult in the home) read books or magazines to your child?; how often does your child read (or pretend to read) books or magazines to you?; how often do you read books with your child that relate to his or her current interests?; how often do you recite rhymes, poems, or sing songs with your child?; how often do you tell stories or jokes to your child?; how often do you take your child to the library or a bookstore?; and how often have you tried to teach your child to read words frequently seen in the environment or in your child's books?

Parent reading belief inventory (PRBI). The Parent Reading Belief Inventory measures parental beliefs and goals about reading with their children (DeBaryshe, 1990). The PRBI has been used in studies of parents of young typically developing children (DeBaryshe, 1995; DeBaryshe & Binder, 1994). This questionnaire consists of 42 items scored along a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree, with some items reverse scored). The items vary in content, but each measure some aspect of parental beliefs about reading. Thus, the questions measure parental efficacy (*as a parent, I play an important role in my child's development*); parental affect (*reading with my child is a special time we love to share*); child participation (*I ask my child a lot of questions when we read*); child growth (*my child is too young to learn about reading*-reverse scored); child knowledge (*I try to make the story more real to my child by relating the story to his or her life*); parental resources (*Even if I would like to, I'm just too busy and too tired to read to my child*-reverse scored); and environmental stimulation (*some children are natural talkers; others are silent. Parents do not have much influence over this*-reverse scored). All items on this measure were added together for a total score. A higher total score on this measure reflects beliefs that parents are important teachers; children should be active participants in reading sessions; the goals of reading are enjoyment, knowledge, and oral language; limited time and resources should not prevent parents from reading with their children; and language is influenced by environmental stimulation (DeBaryshe & Binder, 1994). For the sample of children with DS in the present study, Cronbach's alpha for the 42 items equaled .82.

Measure of children's interest in reading

Child Interest in Reading Questionnaire. This questionnaire, measuring children's enjoyment of reading, was created for the present study and was based on previous studies that have examined children's interest in reading (DeBaryshe, 1995; Storch & Whitehurst, 2001). The four items were scored along a 5-point Likert scale (1 = never; 5 = everyday). The sum of the four items was used as the indicator of children's interest in reading, with a higher score representing greater child interest in reading. The questionnaire contains the following items: 1) In a typical week, how often does your child amuse himself/herself with books?; 2) In a typical week, how often does your child ask you to read to him/her?; 3) Typically, how much does your child like reading books with you?; and 4) How many books does your child like to read each time you read with him/her? For the sample of children with DS in the present study, Cronbach's alpha for the four items of the Child Interest in Reading Questionnaire equaled .62.

Measures assessing children's functioning

Stanford-Binet Intelligence Scale, Fourth Edition. The general purpose abbreviated battery of the Stanford-Binet Intelligence Scale IV assesses the four cognitive areas of verbal reasoning, quantitative reasoning, abstract/visual reasoning, and short-term memory (Thorndike et al., 1986). The six subtests of

vocabulary, comprehension, pattern analysis, quantitative, memory for sentences, and bead memory were administered to the children in this study. This battery requires less time than the complete battery, but still provides a reasonably accurate estimate of cognitive level. Normed on more than 5,000 individuals, the Stanford-Binet Intelligence Scale IV has good validity and reliability (with the median reliability for the composite score across all ages equal to .97). The Stanford-Binet Intelligence Scale IV has been used in studies of children with Down syndrome (Miller, 1999).

Measures of children's emergent literacy skills

Test of Early Reading Ability-3. The Test of Early Reading Ability-3 (TERA-3) was used to measure children's emergent literacy skills (Reid, Hresko, & Hammill, 2001). The TERA-3 contains three subtests: Alphabet (knowledge of alphabet, sound-letter correspondence, and basic sight words), Conventions (familiarity with print conventions), and Meaning (ability to comprehend the meaning of printed material). The subtests are presented in a spiral booklet to be placed in front of the child, with small item-by-item directions written at the top for the examiner. In the Alphabet subtest, the child identifies letter names, words, and sounds in words by pointing to or naming them, as well as identifying the number of phonemes and syllables in visually presented words. In the Conventions subtest, the child is again presented with visual stimuli (such as a logo, pages of a book, or a paragraph) and identifies through pointing or a verbal response various aspects of print conventions, such as book orientation, letter and word orientation, directionality of text, punctuation, capitalization, and spelling. In the Meaning subtest, the child identifies environmental print such as logos, matches words with pictures, and responds to comprehension questions about words, sentences, and paragraphs. For the purpose of this study, age-equivalent scores on each of the subtests were used as measures of children's alphabet knowledge, familiarity with conventions of print, and comprehension skills. Normed on more than 1,000 children across the United States, the TERA-3 has good validity and reliability (approaching or exceeding .90 on all but two coefficients). Earlier editions of the TERA have been used with young typically developing children ages 3 to 8, and thus are appropriate for use with the children with DS of similar mental ages in the present study (DeBaryshe, Binder, & Buell, 2000; van Kleeck, 1990).

DIBELS Initial Sounds Fluency Test (ISF)

This brief phonological awareness test assesses a child's ability to recognize and produce the initial sound in an orally presented word (Kaminski & Good, 1998). The child is presented with four pictures and listens to the examiner name each picture. The child then identifies (by pointing or saying) the picture that begins with the sound produced orally by the examiner. This measure consists of 16 items, which are scored as either 0 or 1. The total time for the child's responses on the 16 items is recorded in seconds using a stopwatch. The ISF score is then calculated using the total number of correct responses in 60 seconds (60 x number correct/duration of response). The ISF score was used as the measure of subjects' phonological awareness ability. The Initial Sounds Fluency Test has good reliability and validity (Good et al., 2004). Since this measure is designed for use with preschool and kindergarten-age typical children, it is also appropriate for children with Down syndrome who are of this mental age.

Peabody Picture Vocabulary Test – Third Edition

Age-equivalent scores on the Peabody Picture Vocabulary Test-III (PPVT-III) were used to measure children's receptive vocabulary skills in this study (Dunn & Dunn, 1997). In this test, child is presented with a set of four pictures while the examiner orally states a stimulus word. The child selects the picture that best represents the meaning of the stimulus word. Normed on more than 2,000 individuals, this test has good validity and reliability (with median reliability coefficients in the .90s). An earlier edition of the PPVT-III has also been used in studies of children and adolescents with Down syndrome (Chapman, 1999; Miller, 1999).

Results

Gender. A series of *t*-tests was conducted to determine if children's gender played a significant role in scores on the measures of home literacy environment, parental beliefs about reading, and children's interest in reading, as well as the children's scores on the emergent literacy measures of TERA-3, PPVT-III, and DIBELS ISF. There were no significant differences between boys and girls on all variables except the measure on parental beliefs about reading. There was a marginal effect of gender on the PRBI total score (girls > boys). Due to its limited role, however, gender was not considered in further analyses of outcome variables. See Table 2 for means and standard deviations of total scores on the questionnaires used in this study.

Table 2. Means and standard deviations on questionnaires

Measure	Mean (Standard deviation)
Home literacy environment	56.97 (8.76)
Parental beliefs about reading	141.71 (11.59)
Children's interest in reading	14.74 (3.19)

Children's Interest in Reading

As shown in Table 3, correlational analyses indicated that children's interest in reading was significantly associated with both the home literacy environment and with parental beliefs about reading. However, there were no significant associations between children's interest in reading and any of the emergent literacy measures of alphabet knowledge, print conventions, comprehension, phonological awareness, or receptive vocabulary. Children's interest in reading also did not correlate with their chronological or mental ages.

Table 3. Correlates of emergent literacy skills in children with DS

Item	PA	Vocab	Meaning AE	Print AE	Alphabet AE	Child interest in reading	Parental beliefs	HLE	CA
MA	.59**	.76**	.61**	.76**	.65**	.10	.30	.33	.48**
CA	.59**	.39*	.29	.59**	.64**	-.28	-.03	-.17	--
HLE	.07	.22	.14	.10	.05	.52**	.51**	--	--
Parental Beliefs	.25	.43**	.39*	.23	.13	.42*	--	--	--
Child reading interest	-.11	-.04	-.21	-.15	-.07	--	--	--	--
Alphabet AE	.57**	.67**	.68**	.61**	--	--	--	--	--
Print AE	.61**	.66**	.67**	--	--	--	--	--	--
Meaning AE	.49**	.77**	--	--	--	--	--	--	--
Vocab	.68**	--	--	--	--	--	--	--	--

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$

Given the small sample size of this study, only the four variables of home literacy environment, parental beliefs about reading, children's chronological age, and children's mental age were then considered as potential predictors of these children's interest in reading in subsequent regression analyses. Results revealed that home literacy environments best predict children's interest in reading, accounting for 27% of the variance ($F = 10.64$, $p < .01$).

Children's Emergent Literacy Skills

Correlational analyses showed that children's mental age was significantly associated with all the children's emergent literacy skills of alphabet knowledge, knowledge of print conventions, comprehension of meaning, receptive vocabulary, and phonological awareness. Similarly, children's chronological age was significantly associated with all but one emergent literacy skill: comprehension of meaning.

The home literacy environment did not correlate with any of the children's emergent literacy skills. However, there was a significant association between parental beliefs about reading and children's emergent literacy skills of receptive vocabulary and comprehension of meaning. Since the total score of the parental beliefs about reading questionnaire correlated with children's receptive vocabulary and comprehension, further correlational analyses were conducted to determine which specific parental beliefs might relate to these particular emergent literacy skills.

Eleven items on the Parental Reading Beliefs Inventory were identified as having to do with comprehension and receptive vocabulary (as opposed to those asking about identifying letters and words in books). The following items were then considered *Meaning*-related parental beliefs (Cronbach's alpha equaled .85): a) Children learn new words, colors, names, etc. from books; b) reading helps children be better talkers and better listeners; c) my child knows the names of many things he or she has seen in books; d) when we read, I want my child to help me tell the story; e) I ask my child a lot of questions

when we read; f) when we read, I want my child to ask questions about the book; g) when we read, we talk about the pictures as much as we read the story; h) stories help build my child's imagination; i) my child learns lessons and morals from the stories we read; j) reading helps children learn about things they never see in real life (like Eskimos); and k) my child learns important life skills from books (like how to follow a cooking recipe).

As shown in Table 4, several of these parental beliefs significantly correlated with children's receptive vocabulary and comprehension of meaning. Parents who expressed the belief that they ask their children a lot of questions when they read together, the belief that they want their children to help tell the story, the belief that children learn life lessons and morals from books, and the belief that children learn important life skills from books had children with higher receptive vocabulary and comprehension. Also, children had higher receptive vocabulary when their parents devoted time to talking about pictures during story reading.

Table 4. Correlations of specific parental beliefs and children's emergent literacy

Specific parental beliefs	Comprehension of meaning	Receptive vocabulary
Child learns new words, colors, names from books	.28	.27
Reading helps child be better talker/listener	.10	.07
Child knows names of many things in books	.26	.21
I want my child to help me tell the story	.36 *	.43 *
I ask my child a lot of questions when we read	.39 *	.40 *
I want child to ask a lot of questions when we read	.18	.16
We talk as much about pictures as we read the story	.34	.49 **
Stories build child's imagination	.19	.22
Child learns lessons/morals from books	.44 *	.58 **
Reading helps child learn about things never see in real life	.13	.27
Child learns important life skills from books	.42 *	.52 **

* Significant at $p < .05$, ** Significant at $p < .01$

Given these significant correlations, regression analyses were then conducted to determine potential predictors of children's emergent literacy skills. Due to the small sample size of this study, mental age, chronological age, and the *Meaning*-related items (grouped together as one variable) were entered as predictor variables.

As shown in Table 5, mental age accounted for 42% of the variance in children's TERA-3 Alphabet scores, 58% of the variance in children's TERA-3 Print Conventions scores, 37% of the variance in children's TERA-3 Meaning scores, 57% of the variance in children's PPVT-III scores, and 34% of the variance in children's DIBELS ISF scores. In addition, children's chronological age accounted for 7% of the variance in TERA-3 Print Conventions scores, 12% of the variance in DIBELS ISF scores, and 14% of the variance in TERA-3 Alphabet scores.

As mental age accounted for the highest variance in emergent literacy skills in children with DS, additional analyses were conducted to determine if there is a necessary (yet not sufficient) mental age that enabled the children to attain beginning levels of literacy. As shown in Table 6, most children who had a mental age of 3.50 years or higher were able to attain alphabet knowledge above 6 years. Similarly, most children with a mental age of 3.50 years or higher were able to attain print knowledge above 5 years.

Table 5. Predictors of emergent literacy in children with DS

Outcome Variable	Predictor	Multiple R	X^2	R^2	F	P
Alphabet knowledge	1. MA 2. CA	.65 .75	.42 .56	--- .14	20.64 8.73	.000 .006
Print conventions	1. MA 2. CA	.76 .80	.58 .65 -	--- .07 -	40.33 5.16	.000 .031 -
Comprehension of meaning	1. MA	.61	.37	---	16.90	.000
Receptive vocabulary	1. MA	.76	.57	---	38.57	.000
Phonological awareness	1. MA 2. CA	.59 .68	.34 .47	--- .12	15.22 6.31	.001 .018

Table 6. Necessary (but not sufficient) MA for Alphabet > 6 years & Print > 5 years

	MA ≥ 3.50 years	MA ≤ 3.50 years	Fisher's $p <$
Alphabet knowledge < 6 years	7	7	0.005
Alphabet knowledge > 6 years	17	0	
Print conventions < 5 years	10	7	0.01
Print conventions > 5 years	14	0	

Discussion

Home literacy environments and parents' beliefs about reading have been found to influence interest in reading and emergent literacy skills of typically developing children (Baker & Scher, 2002; Bus et al., 1995; DeTemple, 2001; Gunn et al., 1998; Payne et al., 1994; Senechal & LeFevre, 2002; Storch and Whitehurst, 2001). Although a few studies have demonstrated that the homes of children with DS have modest levels of literacy experiences, with parents reading to their children 10 to 30 minutes a day (Al Otaiba et al., 2009; Fitzgerald et al., 1995; Trenholm & Mirenda, 2006), there still exists limited research on how home literacy practices and parental beliefs might relate to interest in reading and emergent literacy development in this population.

One goal of the present study then was to examine the correlates of interest in reading among children with DS. Within this study, neither mental age nor chronological age related to children's interest in reading. Instead, the home literacy environment was the best predictor of interest in reading in children with DS, as has been found in previous studies of typical children (Baker & Scher, 2002; DeBaryshe, 1995). For children with DS, their interest in reading also correlated significantly with their parents' literacy-facilitating beliefs, indicating that what parents believe about literacy does indeed relate to their children's interest in reading. Thus, the frequency of home literacy activities matters more for fostering children's interest in reading than chronological or mental age. This finding provides evidence that parents of children with DS can consider enriching their home literacy environments in order to spark children's interest in reading.

Another goal of the present study was to explore the relationship between the home literacy environment and emergent literacy skills in children with DS. In contrast to research on typical populations, the present study found no significant correlations between the home literacy environment and any emergent literacy outcomes in children with DS. Instead, mental age emerged as the best predictor of alphabet

knowledge, familiarity with print conventions, comprehension of meaning, receptive vocabulary, and phonological awareness in children with DS. Thus, it appears that mental age as opposed to the frequency of home literacy activities matters more for the development of emergent literacy in this population. This finding is consistent with earlier research showing that mental age is the factor most strongly related to the academic achievement of children with DS (Sloper, Cunningham, Turner, & Knussen, 1990).

As mental age was the best predictor of emergent literacy outcomes, the present study also attempted to determine if there is a necessary (but not sufficient) mental age for children with DS to achieve some early literacy skills. Confirming previous studies that showed that children with DS could achieve reading skills that were more advanced than their own cognitive abilities (Byrne et al., 2002; Byrne et al., 1995), this study found that several children with DS who had a mental age of 3.50 years could achieve alphabet and sight word knowledge above years and print knowledge above years. Because a mental age of 3.50 years is relatively young, this study underscores that children with DS should not be limited in their access to literacy.

The present study also found that chronological age was itself an independent predictor (after mental age) that accounted between 7% to 14% of the variance in alphabet and sight word knowledge, familiarity with print conventions, and phonological awareness – a finding that may be explained by long-term and school exposure. Children's knowledge of print conventions develops slowly in the preschool years but accelerates as a result of instruction when a child enters school. While skills in alphabet, sight word, print conventions, and phonological awareness can be developed through long-term exposure, children's receptive vocabulary and comprehension of meaning require more complex, cognitively dependent knowledge, thus explaining why chronological age was not a predictor of receptive vocabulary and comprehension in children with DS.

This study also explored the relationship between parental beliefs about reading and the emergent literacy skills of children with DS. Results showed that parents who expressed beliefs about enhancing children's comprehension did indeed have children who scored higher on measures of receptive vocabulary and comprehension. While there was a significant correlation between parental beliefs about reading and the frequency of home literacy activities they provided ($r = .51$, $p < .01$), it appears that parental beliefs matter more than home literacy environments for promoting emergent literacy in children with DS. Although we are uncertain about the direction of causality, children with DS seem to achieve higher levels of receptive vocabulary and comprehension when their parents ask them a lot of questions during book reading; encourage them to help tell the story; talk as much about the pictures as reading the story; and encourage them to learn morals, lessons, and important life skills from books. Perhaps these beliefs are leading parents to engage in a quality of interaction that increases their children's receptive vocabulary and comprehension. This is an area worthy of further investigation, especially given that previous studies have found that relatively few parents reported asking higher-level questions of their children with DS during storybook reading (Trenholm & Mirenda, 2006).

Limitations and implications

This study has several implications for children with DS and their families. First, this study provides support for increasing literacy activities in the homes of children with DS. Since the home literacy environment is the best predictor of reading interest in these children, parents may benefit from guidance on how to provide more literacy activities in their homes and increase their children's interest in reading. This study also identifies certain parent beliefs that are related to higher comprehension and receptive vocabulary in children with DS. Furthermore, this study underscores the importance of appropriate literacy interventions for children with DS. Since long-term exposure, here shown by the independent predictor of chronological age, seems important at least for these children's ability to learn the alphabet and sight words as well as the conventions of print, perhaps they could demonstrate even further literacy gains given exposure to literacy at earlier ages.

The limitations of the present study must also be considered. First, this study's measures of home literacy environment, children's interest in reading, and parental beliefs about reading were parent-report questionnaires. Although most previous studies of home literacy environments have also been based on questionnaires, observing parents and children in their literacy interactions within the home may provide a more detailed analysis of home literacy environments. Perhaps the quality rather than the quantity of home literacy activities influences the development of emergent literacy skills in these children. The

present study also did not measure children's school instruction or formal home-based interventions. Earlier studies have shown that the type of school placement (i.e. mainstream versus segregated) has an effect – over and above that of mental age – on the academic attainment of children with DS (Sloper et al., 1990). Finally, this study has a small sample of participants, limiting its generalizability regarding predictors of reading interest and emergent literacy skills in children with DS.

Despite these limitations, however, the present study begins to tell us more about home literacy environments, parents' beliefs about reading, children's interest in reading, and the development of emergent literacy skills in this population. While mental age appears to be the best predictor of emergent literacy skills in children with DS, this study provides evidence that exposure over time can improve these children's alphabet, sight word, and print knowledge beyond what is expected for their mental age. Furthermore, specific parental beliefs may influence receptive vocabulary and comprehension in children with DS, and it appears that the home literacy environment can play a key role in increasing these children's interest in reading. This study is a step toward helping parents further promotes the literacy skills of their children with DS.

References

Al Otaiba, S., Lewis, S., & Whalon, K. (2009). Home literacy environments of young children with Down syndrome: Findings from a web-based survey. *Remedial and Special Education, 30*, 96-107.

Baker, L., & Scher, D. (2002). Beginning readers' motivation for reading in relation to parental beliefs and home reading experiences. *Reading Psychology, 23*, 239-269.

Bochner, S., Outhred, L., & Pieterse, M. (2001). A study of functional literacy skills in young adults with Down syndrome. *International Journal of Disability, Development and Education, 48*, 67-90.

Buckley, S. (1995). Teaching children with Down syndrome to read and write. In L. Nadel, & D. Rosenthal (Eds.), *Down syndrome: Living and learning in the community* (pp. 158-169). New York: Wiley-Liss.

Buckley, S., & Sacks, B. I. (1987). *The adolescent with Down's syndrome – life for the teenager and for the family*. Portsmouth, UK: Portsmouth Polytechnic.

Buckley, S., Bird, G., & Byrne, A. (1996). The practical and theoretical significance of teaching literacy skills to children with Down's. In J. A. Rondal, J. Perera L. Nadel, & A. Comblain (Eds.), *Down's syndrome: Psychological, psychobiological, and socio-educational perspectives* (pp. 119-128). London: Whurr.

Bus, A. G., van IJzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research, 65*, 1-21.

Byrne, A., MacDonald, J., & Buckley, S. (2002). Reading, language, and memory skills: A comparative longitudinal study of children with Down syndrome and their mainstream peers. *British Journal of Educational Psychology, 72*, 513-529.

Byrne, A., Buckley, S., MacDonald, J., & Bird, G. (1995). Investigating the literacy, language, and memory skills of children with Down's syndrome. *Down's Syndrome: Research and Practice, 3*, 53-58.

Chapman, R. S. (1999). Language development in children and adolescents with Down syndrome. In J. F. Miller, M. Leddy, & L. A. Leavitt (Eds.), *Improving the communication of people with Down syndrome* (pp. 41-60). Baltimore, MD: Paul H. Brookes.

Clay, M. M. (1985). *Concepts about print*. Portsmouth, NH: Heinemann.

DeBaryshe, B. D. (1990). *Parent Reading Belief Inventory*. Honolulu, HI: University of Hawaii at Manoa Center on the Family.

DeBaryshe, B. D. (1995). Maternal belief systems: Linchpin in the home reading process. *Journal of Applied Developmental Psychology, 16*, 1-20.

DeBaryshe, B. D., & Binder, J. C. (1994). Development of an instrument for measuring parental beliefs about reading aloud to young children. *Perceptual and Motor Skills, 78*, 1303-1311.

DeTemple, J. M. (2001). Parents and children reading books together. In D. K. Dickinson, & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and school* (pp. 31-52). Baltimore, MD: Paul H. Brookes.

Dunn, L. M., & Dunn, L. M. (1997). *Peabody Picture Vocabulary Test—Third Edition*. Circle Pines, MN: American Guidance Service.

Ehri, L. C., & Sweet, J. (1991). Fingerpoint-reading of memorized text: What enables beginners to process the print? *Reading Research Quarterly, 26*, 442-462.

Fidler, D. J., Lawson, J. E., & Hodapp, R. M. (2003). What do parents want?: An analysis of education-related comments made by parents of children with different genetic syndromes. *Journal of Intellectual and Developmental Disability, 28*(2), 196-204.

Fitzgerald, J., Roberts, J., Pierce, P., & Schuele, M. (1995). Evaluation of home literacy environment: An illustration with preschool children with Down syndrome. *Reading & Writing Quarterly: Overcoming Learning Difficulties, 11*, 311-334.

Fowler, A. (1990). Language abilities in children with Down syndrome: Evidence for a specific syntactic delay. In D. Cicchetti, & M. Beeghly (Eds.), *Children with Down syndrome: A developmental perspective* (pp. 302-328). Cambridge: Cambridge University Press.

Foy, J. G., & Mann, V. (2003). Home literacy environment and phonological awareness in preschool children: Differential effects for rhyme and phoneme awareness. *Applied Psycholinguistics, 24*, 59-88.

Good, R. H., Kaminski, R. A., Shinn, M., Bratten, J., Shinn, M., Laimon, L., Smith, S., & Flindt, N. (2004). *Technical Adequacy and Decision Making Utility of DIBELS* (Technical Report No. 7). Eugene, OR: University of Oregon.

Griffin, E. A., & Morrison, F. J. (1997). The unique contribution of home literacy environment to differences in early literacy skills. *Early Child Development and Care, 127*, 233-243.

Gunn, B. K., Simmons, D. C., & Kameenui, E. J. (1998). Emergent literacy: Research bases. In D. C. Simmons, & E. J. Kameenui (Eds.), *What reading research tells us about children with diverse learning needs: Bases and basics* (pp. 2-50) New Jersey: Erlbaum.

Hodapp, R. M., Evans, D., & Gray, F. L. (1999). Intellectual development in children with Down syndrome. In J. A. Rondal, J. Perera, & L. Nadel (Eds.), *Down's syndrome: A review of current knowledge* (pp. 124-132). London: Whurr.

Hodapp, R. M., Leckman, J. F., Dykens, E. M., Sparrow, S. S., Zelinsky, D., & Ort, S. I. (1992). K-ABC profiles in children with fragile X syndrome, Down syndrome, and non-specific mental retardation. *American Journal on Mental Retardation, 97*, 39-46.

Hodapp, R. M., & Ricci, L. A. (2002). Behavioral phenotypes and educational practice: The unrealized connection. In G. O'Brien, & O. Udwin (Eds.), *Behavioral phenotypes in clinical practice*. London: Mac Keith Press.

Johnston, R. S., Anderson, M., & Holligan, C. (1996). Knowledge of the alphabet and explicit awareness of phonemes in pre-readers: The nature of the relationship. *Reading & Writing, 8*, 217-234.

Kaminski R. A. & Good R. H. (1998) Assessing early literacy skills in a problem solving model: Dynamic Indicators of Basic Early Literacy Skills. In M.R. Shinn (Ed.), *Advanced applications of Curriculum-Based Measurement* (pp. 113-142). New York: Guilford.

Kumin, L. (1994). Intelligibility of speech in children with Down syndrome in natural settings: Parents' perspective. *Perceptual and Motor Skills, 78*, 307-313.

Laws, G., Buckley, S., Bird, G., MacDonald, J., & Broadley, I. (1995). The influence of reading instruction on language and memory development in children with Down's syndrome. *Down's Syndrome: Research and Practice, 3*, 59-64.

Laws, G., & Gunn, D. (2002). Relationships between reading, phonological skills, and language development in individuals with Down syndrome: A five year follow-up study. *Reading & Writing, 15*, 527-548.

Leddy, M. (1999). The biological bases of speech in people with Down syndrome. In J. F. Miller, M. Leddy, & L. A. Leavitt (Eds.), *Improving the communication of people with Down syndrome* (pp. 61-80). Baltimore, MD: Paul H. Brookes.

Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: Evidence from a latent-variable longitudinal study. *Developmental Psychology, 36*, 596-613.

Marcell, M., & Armstrong, V. (1982). Auditory and visual sequential memory of Down syndrome and nonretarded children. *American Journal of Mental Deficiency, 87*, 86-95.

Mason, J. M., & Allen, J. (1996). A review of emergent literacy with implications for research and practice in reading. *Review of Research in Education, 13*, 3-47.

Miller, J. F. (1999). Profiles of language development in children with Down syndrome. In J. F. Miller, M. Leddy, & L. A. Leavitt (Eds.), *Improving the communication of people with Down syndrome* (pp. 11-39). Baltimore, MD: Paul H. Brookes.

Payne, A. C., Whitehurst, G. J., & Angell, A. L. (1994). The role of home literacy environment in the development of language ability in preschool children from low-income homes. *Early Childhood Research Quarterly, 9*, 427-440.

Pueschel, S. M., Gallagher, P. L., Zartler, A. S., & Pezzullo, J. C. (1987). Cognitive and learning processes in children with Down syndrome. *Research in Developmental Disabilities, 8*, 21-37.

Reid, D. K., Hresko, W. P., & Hammill, D. D. (2001). *Test of Early Reading Ability-Third Edition*. Austin, TX: Pro-ed.
Senechal, M., & LeFevre, J. (2002). Parental involvement in the development of children's reading skill: A five-year longitudinal study. *Child Development, 73*, 445-460.
Sloper, P., Cunningham, C., Turner, S., & Knussen, C. (1990). Factors related to the academic attainments of children with Down's syndrome. *British Journal of Educational Psychology, 60*, 284-298.
Storch, S. A., & Whitehurst, G. J. (2001). The role of family and home in the literacy development of children from low-income backgrounds. *New Directions for Child and Adolescent Development, 92*, 53-71.
Sulzby, E., & Teale, W. (1991). Emergent literacy. In R. Barr, M. L. Kamil, P. B. Mosenthal, & P. D. Pearson (Eds.), *Handbook of reading research* (pp. 727-757). New York: Longman.
Thorndike, R. L., Hagen, E. P., & Sattler, J. M. (1986). *Stanford-Binet Intelligence Scale– Fourth Edition*. Chicago: Riverside.
Treiman, R., Tincoff, R., Rodriguez, K., Mouzaki, A., & Francis, D. (1998). The foundations of literacy: Learning the sounds of letters. *Child Development, 69*(6), 1524-40.
Trenholm, B., & Mirenda, P. (2006). Home and community literacy experiences of individuals with Down syndrome. *Down Syndrome Research and Practice, 10*, 30-40.
van Kleeck, A. (1990). Emergent literacy: Learning about print before learning to read. *Topics in Language Disorders, 10*, 25-45.
Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development, 69*, 848-872.
Yopp, H. K. (1985). Phoneme segmentation ability: A prerequisite for phonics and sight word achievement in beginning reading? *National Reading Conference Yearbook, 34*, 330-336.