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Relations between Home Literacy Environment, Child Characteristics, and Print Knowledge for Preschool Children with Language Impairment

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Running Head: Home Literacy Environment

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Abstract

To contribute to the modest body of work examining the home literacy environment (HLE) and emergent literacy outcomes for children with disabilities, this study addressed two aims: (a) to determine the unique contributions of the HLE on print knowledge of preschool children with language impairment (LI); and (b) to identify whether specific child characteristics (oral language ability, print interest) moderated these relations. The sample consisted of 119 preschool children with LI. HLE was conceptualized as frequency of storybook reading and literacy teaching during book reading. Frequency of storybook reading was a unique predictor of print knowledge, which is consistent with research on children with typical language. Literacy teaching did not predict print knowledge, which diverges from research on children with typical language. No interactions between the HLE and child characteristics were significant, but language ability and print interest play a role in understanding individual differences in literacy development.

Keywords: early literacy, preschool, language impairment, home literacy environment, oral language skills

Implications for Practice

What is already known about this topic:

• Researchers have demonstrated a consistent relation between young children's print knowledge and their later reading ability. Further, research suggests that young children with language impairment (LI) tend to perform poorly on measures of print knowledge.
• For young children developing typically, the home literacy environment (HLE) has received considerable attention given its potential role as a mechanism that facilitates children's development of print knowledge as well as other emergent literacy skills.
• The limited work that has examined the HLE for children with LI has suggested that the HLE may relate differently to emergent literacy skills for children with LI than for those developing typically.

What this paper adds:

• Findings from this study demonstrate that shared reading frequency may have modest but observable impacts on the literacy skills of young children with LI, even after controlling for maternal education and nonverbal intelligence functioning.
• Study results also demonstrate that children's characteristics, specifically language ability and print interest, play a role in understanding individual differences in literacy development for children with LI.

Implications for practice and/or policy:

• The results of the current work demonstrate that we cannot necessarily generalize understanding of features of the HLE that positively affect the development of children who are typically developing to explain the experiences of children with LI.
• Study findings also point to the importance of supporting children's oral language skills and interest in print as potential mechanisms for promoting literacy growth.
• As children with LI are at great risk for reading difficulties and because increased print knowledge contributes to reading progress, it is of critical importance to continue to examine the mechanisms by which children with disabilities develop print knowledge as well as identify which practices are effective in improving these skills.

Relations among the Home Literacy Environment, Child Characteristics, and Print Knowledge for Preschool Children with Language Impairment

A large number of educational policies and national initiatives assert the importance of promoting early literacy achievement among young children as a means for mitigating the relatively high prevalence of reading difficulties among American youth. For example, many states' early childhood standards strongly emphasize the targeting of literacy skills within preschool programming. Children with language impairment (LI) exhibit a particular susceptibility for developing reading difficulties. Catts and colleagues (2002) found that over one-half (53%) of children with LI are diagnosed with reading disabilities in second grade, and Bishop and Adams (1990) found that preschool children with language problems are six times more likely to develop reading problems than children with typical language skills. Children with LI often show delays in early literacy skills that serve as foundational for future reading achievements (Catts, Fey, Tomblin, & Zhang, 2002; Justice, Bowles & Skibbe, 2006).

Print knowledge, one important set of early literacy skills, is a multidimensional construct that represents children's emergent understanding about print, including their knowledge of book and print organization, print meaning, letters, and words (Justice & Ezell, 2004; Storch & Whitehurst, 2002). Researchers have demonstrated a consistent relation between young children's print knowledge and their later reading ability (Purcell-Gates, 1996; Sènechal, 2006; Sènechal & LèFevre, 2003). Letter knowledge is a particularly robust predictor of preschool-aged children's later reading achievement (e.g., Evans, Shaw, & Bell, 2000; National Early Literacy Panel, 2008; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004). Unfortunately, young children with language delays tend to perform poorly on measures of print knowledge. For example, they know only a fraction of the letter names compared to their peers

with typical language (Boudreau & Hedberg, 1999; Justice et al., 2006; Skibbe et al., 2008a). As Skibbe et al. (2008a) showed, these early lags in print knowledge appear to directly contribute to the poor long-term performance in reading achievement exhibited by children with LI.

The aim of the present study was to further our understanding of the print knowledge of children with LI, with a particular focus on how features of the home literacy environment (HLE) might be associated with development of print knowledge. Our study is guided by social-constructivist (Bruner, 1978; Vygotsky, 1978) and transactional (Samaroff & Fiese, 2000) theories. According to social-constructivist theory, a child acquires literacy (and other) skills through interactions with knowledgeable members of society (e.g., caregivers). For young children developing typically, the HLE has received considerable attention given its potential role as a mechanism that facilitates children's development of print knowledge as well as other emergent literacy skills, such as vocabulary and phonological awareness (e.g., Burgess, Hecht, & Lonigan, 2002; Bus, van IJzendoorn, & Pellegrini, 1995; Evans et al., 2000; Sènèchal, LeFevre, Thomas, & Daley, 1998). The limited work with children with LI has suggested that the HLE may relate differently to emergent literacy skills for children with disabilities than for those developing typically (McGinty & Justice, 2009; Skibbe, Justice, Zucker, & McGinty, 2008). Transactional theory posits that a child's development is due to the interaction between the child and the child's experience, recognizing that the experiences a child receives is driven in some part by the child him/herself. Thus, we sought to determine whether children's oral language ability and their interest in literacy activities, two constructs which are predictors of early literacy skills among children developing typically, moderated the relations between the HLE and children's print knowledge.

HLE Constructs and Children's Early Literacy Skills

Researchers have, for some time, been concerned with understanding the relations between specific aspects of the HLE and children's early literacy achievements (e.g., Burgess et al., 2002; Roberts, Jurgens, & Burchinal, 2005; Sènèchal et al., 1998). HLE is generally conceived as a multidimensional construct, the dimensions of which relate differentially to various child outcomes. We examined two features of the HLE for their potential relations to children's print development: (a) frequency of storybook reading and (b) literacy teaching.

Frequency of storybook reading. The role of the HLE in supporting children's literacy development has often emphasized the importance of caregiver-child shared storybook reading, in particular to the frequency of reading. Several studies have demonstrated significant and positive relations between frequency of reading and children's early literacy skills (Bus et al., 1995; Foy & Mann, 2003; Fritjers, Barron, & Brunello, 2000; Kim, 2009; Sonnenschein & Munsterman, 2002). Such findings have helped to support the popular perspective that reading to young children is a salient means for enhancing their literacy development. Although the frequency of storybook reading may positively contribute to children's oral language skills, its relations to code-based skills, including print knowledge, are often trivial or nonexistent (Burgess et al., 2002; Evans et al., 2000; Hood, Conlon, & Andrews, 2008; Roberts et al., 2005; Sènèchal, 2006; Sènèchal & LeFevre, 2003; Sènèchal et al., 1998), unless reading interactions are manipulated to include explicit caregiver teaching about literacy (e.g., Justice & Ezell, 2000).

Literacy teaching. Sènèchal and colleagues (1998) were one of the first research teams to document the positive relations between children's print knowledge and literacy teaching by caregivers, which was operationalized in their study as the frequency with which caregivers reported directly teaching their children to read and print words. In subsequent studies, literacy teaching has been significantly linked to children's print knowledge (Evans et al., 2000; Foy &

Mann, 2003; Sènèchal & LeFevre, 2003; Stephenson, Parrila, Georgeou, & Kirby, 2008). Results of very stringent analyses reveal that caregiver literacy teaching accounts for 4 to 10% of variance in children's print knowledge after controlling for multiple child and family variables (Evans et al., 2000; Sènèchal & LeFevre, 2003; Sènèchal, 2006).

Potential Moderators of Relations between HLE and Print Knowledge

In keeping with transactional theory, we hypothesized that the relations between the HLE and children's print knowledge may be moderated by characteristics of the child, specifically children's oral language skills and literacy interest. Building on prior studies showing that children's literacy interest and oral language skills are influential to their literacy development (Justice, Chow, Capelinni, Flanigan, & Colton, 2003), we examined whether the relations between the HLE and children's print knowledge were moderated by these two child characteristics. Children's literacy interest refers to children's enjoyment of and motivation towards reading experiences. Numerous researchers have found a positive relation between children's literacy interest (e.g., children's requests to be read to and how often children look at books on their own) and their literacy outcomes (Dale & Crain-Thoreson, 1999; Deckner, Adamson, & Bakeman, 2006; Fritjers et al., 2000; Sènèchal & LeFevre, 2003; Sènèchal, 2006). Fritjers and colleagues (2000) reported children's literacy interest accounted for 6% of variance in letter-name and letter-sound knowledge. In a longitudinal study, children's interest in storybook reading at two years of age predicted reading scores four years later (Dale & Crain-Thoreson, 1999). Although there is evidence of the relation between literacy interest and children's literacy outcomes, findings have largely concerned children who are typically developing. It is important to explore the association with children with LI.

Oral language ability has also consistently been a predictor of children's emergent literacy abilities (e.g., Boudreau & Hedberg, 1999; Justice et al., 2003; Lonigan, Burgess, & Anthony, 2000), including print knowledge (Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003; Storch & Whitehurst 2002). Kadarevek and Sulzby (2000) found that children with stronger language abilities benefitted more from literacy experiences than children with weaker language abilities, which suggests that children's language skills may moderate the association of the HLE to children's literacy development. However, McGinty and Justice's (2009) study of children with LI failed to show that children's language skills moderated the relations between the HLE and children's literacy skills. Further investigation is needed to understand the relation between HLE and oral language skill for children with LI.

Study Purpose and Research Questions

The overall purpose of this study was to examine the contribution of two dimensions of the HLE to the print knowledge of children with LI. Two specific research questions structured our work. The first question, guided by a social-constructive perspective, asked: To what extent do features of the HLE, namely frequency of storybook reading and literacy teaching, contribute to the print knowledge of children with LI? The second question, guided by transactional theory, asked: To what extent are the relations between the HLE and children's print knowledge moderated by children's print interest and oral language skills?

As the prior literature has predominantly focused on the relation between the HLE and literacy outcomes for children developing typically, with only one study of which we are aware examining the interplay among such relations among children with LI (McGinty & Justice, 2009), this study is exploratory. However, after reviewing the available literature, we hypothesized that literacy teaching would more strongly predict children's print knowledge as

compared to storybook reading frequency. We hypothesized that children with higher levels of print knowledge and oral language ability would derive more benefit from their HLE resulting in a positive effect on print knowledge ability.

Method

Participants

Participants were 119 preschool children with language impairment in 50 public early childhood special education (ECSE) classrooms in one Midwestern state. In this state, an ECSE classroom enrolls between 6 and 10 children with disabilities (i.e., with individual education plans [IEPs]) and up to six children who are typically developing. The children represented members of two cohorts of a larger study (n = 220 preschoolers). We eliminated 75 children younger than four years of age because they were not administered an assessment of nonverbal intelligence (used as a control variable and described in the results). Of the remaining 145 children, we only included children with IEPs (n = 137) and who had all relevant data required for main study analyses. For the 18 children excluded due to missing data, there were no significant differences in any of the variables of interest (note: degrees of freedom differ depending on the number of children missing data on the measure; print knowledge: t (134) = 1.31, p = .19; frequency of storybook reading: t (127) = .23, p = .82; literacy teaching: t (125) = .14, p = .99; print interest (t (128) = .68, p = .50; oral language ability: t (132) = 1.71, p = .09; non-verbal intelligence: t (129) = 1.64, p = .10).

In addition to having an IEP, all children met one of the following three conditions: (a) currently receiving speech-language services (88%); (b) a professional identified the child as having a language impairment (94%); or (c) the classroom teacher had serious concerns about the child's language development (91%); the majority of children (78%) met all of these

conditions. Half of the children (49%) received occupational therapy services and one-quarter (25%) received physical therapy services. Teacher and caregiver report indicated that 29 (24%) of the children had identifiable developmental disabilities, to include autism (n = 17), cerebral palsy (n = 2), Down syndrome (n = 3), ADHD (n = 2), and other diagnoses (e.g., William's Syndrome, apraxia; n = 4).

Children ranged in age from 48 to 69 months (M = 56 months). The majority of the sample was boys (77%) as is the norm in special education (e.g., Oswald, Best, Coutinho, & Nagle, 2003). Children were administered an assessment of non-verbal intellectual functioning using the Matrices subtest of the *Kaufman Brief Intelligence Test* (Kaufman & Kaufman, 2004), which has a mean standard score of 100 and a standard deviation of 15. Children's standard scores ranged from 53 to 124, with a mean of 82.66 (SD = 18.02). Approximately one-fifth (21%) of the sample scored at or above the mean standard score of 100, but over one-third of the sample (36%) scored below a standard score of 70. Thus, this sample of children exhibited low nonverbal cognition.

All caregivers reported their children spoke English in the home. The majority (83%) of children were Caucasian, while 11.8% and 2.5% were Black/African-American and Latino, respectively. Maternal education attainment was widely dispersed from “some high school but no diploma” (2.5%) to doctoral degree (1.7%); the median maternal education attainment was an associate’s degree (7.6%). Caregivers reported annual total income ranging from “$5,000 or less” (7.8%) to “$85,001 or more” (24.3%), with the median being “$60,001 to$ 65,000” (2.9%).

Procedures

The procedures involved collecting direct assessment data on children and a caregiver-completed questionnaire. Caregivers completed a questionnaire on general demographic

information, caregiver report of the home literacy environment, and other information during one-on-one meetings with a research staff member. The purpose of the meeting was to inform caregivers about the larger study, review participation requirements, and gain caregiver consent for their child's participation in the study.

Subsequently, in a six-week window held in September and October, trained examiners administered a one-on-one battery involving a hearing screening and direct cognitive and language assessments to children. The battery was conducted in the children's schools and was typically administered in two sessions. Children received incentives upon completion of each session (e.g., stickers, books).

These activities were nested within a larger study which was to examine the efficacy of a print-referencing style of reading (see Justice & Ezell, 2000) with children in ECSE classrooms. This approach to early-literacy intervention is described extensively in Justice and Ezell (2004). Children were randomly assigned to one of three conditions: (a) print-referencing style used by teacher and reading as usual (regular reading) by caregiver (n = 28); (b) print-referencing style used by teacher and caregiver (n = 44); and (c) regular reading by teacher and caregiver (n = 47). All teachers and caregivers, regardless of condition, received the same study books and were asked to read one book per week to children. Teachers were asked to read four times per week as a whole-class activity, and caregivers were asked to read two times each week. No intervention training or implementation was conducted prior to collection of the data used in the study. There were no differences in children's direct assessments attributable to study condition (print knowledge: F (2, 116) = .36, p = .70; oral language ability: F (2, 116) = .58, p = .57; nonverbal intelligence: F (2, 116) = 1.77, p = .18). When comparing the caregiver-child dyads using print-referencing at home (n = 44) to caregivers who were reading as usual (n= 75), there

were no differences in caregiver-reported home literacy practices (frequency of storybook reading: (t (117) = .32, p = .75; literacy teaching: t (117) = 1.00, p = .32) or children's print interest (t (117) = -.33, p = .74).

Measures

Measures used in this study were of two major types: (a) measures of children's skills and interests (print knowledge, oral language, print interest, and nonverbal intelligence functioning) and (b) measures of the HLE (frequency of storybook reading and literacy teaching).

Children's print knowledge. Children's print knowledge was based on a composite score derived from two subtests of the *Phonological Awareness Literacy Screening for Preschool* (PALS-PreK; Invernizzi, Sullivan, Meier, & Swank, 2004) and the *Preschool Word and Print Awareness Assessment* (PWPA; Justice et al., 2006). Raw scores for PALS-PreK Upper-Case Alphabet Recognition, PALS-PreK Name Writing, and PWPA were converted to standardized *Z*-scores and summed to create a composite index of print knowledge. Theoretical and empirical evidence support the use of a composite score on the basis that these measures assess a single construct of print-related skills (e.g., Boudreau & Hedberg, 1999; Lomax & McGee, 1987; McGinty & Justice, 2009).

The PALS-PreK is a phonological awareness and literacy screening designed to measure preschoolers' developing knowledge of important literacy fundamentals. For the Upper-Case Alphabet Recognition subtest, the examiner presented the child all 26 upper-case letters, in random order, and asked the child to identify the letter name. The score represents the number of letters correctly identified. For the Name Writing portion, the child was asked to draw a picture of him/herself and write his/her name beside it. Children's responses are scored on a

scale of zero (name is a scribble; scribble represents both picture of self and name) to seven (name is written correctly and is separate from picture). The PALS manual reports inter-rater reliability (Pearson product-moment correlation coefficient) is .99 for both subtests (Invernizzi et al., 2004).

The PWPA is a measure of children's knowledge of 14 print concepts (e.g., book orientation, print directionality, print function, letters, words). The PWPA is administered while reading a uniform picture book. Most items are either scored as a 0 (*incorrect*), or 1 (*correct*), though partial credit is given for some items. A total of 17 points are possible on the PWPA. Test developers report an inter-rater reliability coefficient of .94 (Justice et al., 2006).

Children's oral language ability. The Core Language Index of the CELF: P-2 (Wiig, Secord, & Semel, 2004), the measure of children's oral language ability, is comprised of three subtests: Word Structure, Sentence Structure, and Expressive Vocabulary. Word Structure assesses the child's ability to use different word endings and tenses (morphology). The Sentence Structure subtest assesses the child's understanding of increasingly complex grammatical sentences. The Expressive Vocabulary subtest assesses the child's ability to label items and actions. The scaled scores from the three subtests are summed to form the Core Language scaled score, which is then derived into a standard score (mean of 100 and standard deviation of 15). The standard score was used in all analyses.

Children's print interest. A measure of children's print interest was derived by creating a composite of two items from 11 items on the caregiver questionnaire focusing on home literacy practices drawn from Bennett, Weigel, and Martin (2002). Two items on this questionnaire, based on results of a factor analysis (eigenvalue of 1.63), were used to represent children's print interest. (We provide further discussion of the factor analysis shortly.) Specifically, on a scale of

0 to 8 (representing 0 to 8 times in a month), caregivers responded to two items concerning (a) the frequency with which children asked family members to write their name (factor loading of .80) and (b) frequency with which children asked for help reading words (factor loading of .81).

Children's nonverbal intelligence functioning. Children's nonverbal intelligence functioning was measured using the Matrices subtest of the Kaufman Brief Intelligence Test-2 Nonverbal subtest (Matrices) (KBIT-2; Kaufman & Kaufman, 2004). Children were shown pictures and abstract designs and asked to complete visual analogies and perceive relationships. The mean standard score is 100 and the standard deviation is 15.

Frequency of storybook reading and literacy teaching. Caregiver responses to the home literacy items (Bennett et al., 2002) were also used to derive the two HLE constructs. Although the use of caregiver questionnaires can be criticized due to potentially biased reporting by caregivers, use of questionnaires highly similar to ours has been well validated in prior work (Sènèchal et al., 1998). Using caregiver ratings of the frequency of 11 caregiver- or child-initiated literacy activities, an exploratory principal components analysis was conducted to extract any underlying factors. (The total *n* for this procedure was 200 because we used all of the surveys completed by the caregivers in cohorts 1 and 2 in the larger project.) One of the 11 items (frequency with which children watched movies and videos) was dropped prior to running the principal components analysis because it did not correlate significantly with any of the other ten items. The subject numbers for the principal component analysis were adequate because there were at least five subjects per measured variable (Gorsuch, 1983). Further, the Kaiser-Meyer-Olkin statistic of sample adequacy (KMO) was .74, exceeding the generally accepted level of .60 (Kaiser & Rice, 1974). A three-factor solution was retained, which explained nearly 60% of the

variance in the items. Two factors pertained to the HLE, while the third factor was print interest (described previously).

The first factor, *frequency of storybook reading* (eigenvalue of 2.35), contained three items concerning the frequency with which children (a) are read to on a weekly basis (factor loading of .84), (b) asked to be read to on a weekly basis (factor loading of .81), and (c) looked at books on their own on a weekly basis (factor loading of .67). The second factor, *literacy teaching during book reading* (eigenvalue of 1.98), contained two items concerning the frequency with which caregivers taught children during shared reading about (a) alphabet letters (factor loading of .82) and (b) individual words (factor loading of .83). Cronbach alphas were.79 and .90, respectively. An additional two items were not included because they did not exhibit theoretical fit with the factor(s) on which they loaded. The frequency that an adult teaches child about reading and writing loaded .43 and .44 with frequency of storybook reading and child print interest, respectively (loaded .15 on the literacy teaching factor). The frequency of reading a child's magazine loaded .65 on literacy teaching (loaded .02 on storybook reading). We also elected not to include frequency of trips to bookstore/library in frequency of book reading (factor loading of .46) because of its lower factor loading, and it is an indirect, rather than a direct, measure of frequency of storybook reading.

Results

Preliminary investigation of the main study variables was conducted to check for outliers and to determine whether data adhered to assumptions of normality, linearity, and homoscedasity as outlined in Tabachnick and Fidell (2001). No assumptions were violated nor were any outliers noted. Also prior to analyses, we examined the main study variables descriptively. Table 1 presents the means, ranges, and standard deviations for children's print knowledge, the HLE

variables, and the child characteristics considered as potential moderators. Regarding children's print knowledge – the outcome of interest - children scored, on average, at the lower end of the three measures of print knowledge. Children knew approximately ten uppercase letters and scored below the midpoint on the name-writing task and PWPA measure. Large standard deviations, especially for letter knowledge, were apparent.

Relation between HLE and Print Knowledge of Preschoolers with Language Impairment

As an initial assessment of the relations between HLE and print knowledge of children with LI, we conducted zero-order correlations (see Table 2) among children's print knowledge, features of the HLE, children's print interest, oral language skills, nonverbal intelligence, and maternal education. Correlations with values of .1, .3, and .5 are interpreted as small, moderate, and large, respectively (Cohen, 1988). Children's print knowledge had a small and significant correlation with frequency of storybook reading but not with literacy teaching during book reading. Additionally, print knowledge demonstrated a small correlation with child's print interest, moderate correlations with nonverbal intelligence and maternal education, and a large correlation with oral language ability.

The first research question sought to determine the unique contributions of frequency of storybook reading and literacy teaching during book reading to the print knowledge of children with LI. For these analyses, we statistically controlled for maternal education and children's nonverbal intelligence, given that they are associated with print knowledge both in this work and in prior studies (Christian, Morrison, & Bryant, 1998; Hood et al., 2008; Sènèchal, 2006; Skibbe et al., 2008b). We conducted two hierarchical regression models (one for each of the two HLE constructs) with maternal education and children's nonverbal intelligence in the first block and the HLE construct in the second block. As indicated in Table 3, maternal education and

children's nonverbal intelligence were significant predictors and together explained 19% of the variance in children's print knowledge. After accounting for the control variables, frequency of storybook reading was a significant predictor of children's print knowledge, explaining an additional 4% of the variance (β = .20, p <.05). Literacy teaching during book reading was not a significant predictor of children's print knowledge (β = .20, p = .24).

Moderating Influences: Children's Print Interest and Language Skills

The second research question examined whether children's print interest and oral language abilities moderated the relations between HLE and children's print knowledge. Each of the two child characteristics was included in two hierarchical regression analyses involving three blocks (see Table 4). In Block 1, maternal education and children's nonverbal intelligence were entered. In Block 2 , we entered one specific HLE variable (i.e., frequency of storybook reading or literacy teaching during book reading) and one child characteristic (i.e., child print interest or oral language ability). In Block 3, we entered the interaction term between the HLE and child characteristic (e.g., print interest * frequency of storybook reading) to determine whether the relation of HLE with print knowledge varied as a function of print interest or oral language.

Children's print interest. As shown in Table 4, the results of Block 3 demonstrated that the relation of both HLE constructs with children's print knowledge did not vary as a function of print interest. The interaction terms were not significant (frequency of storybook reading model: β = .04, p = .67; literacy teaching during book reading model: β = .10, p = .24). However, child print interest was significantly related to print knowledge when holding literacy teaching during book reading constant (β = .18, p < .05), but was not significantly related in the model with frequency of storybook reading (β = .14, p = .13).

***Children's oral language ability*.** Table 4 also indicates that children's oral language ability did not play a moderating role in the relations between the HLE dimensions and print knowledge. The interaction terms in Block 3 were not significant (frequency of storybook reading model: $\beta = .09$, $p = .25$; literacy teaching during book reading model: $\beta = .03$, $p = .67$). Children's oral language ability was a significant predictor of print knowledge in both models (frequency of storybook reading model: $\beta = .48$, $p < .001$; literacy teaching during book reading model: $\beta = .49$, $p < .001$) As a follow-up, we conducted two hierarchical regression models to determine the unique variance of oral language ability on children's print knowledge, after controlling for maternal education, nonverbal intelligence, and the respective HLE component. Table 5 shows that oral language ability explained a robust 14% of the unique variance to children's print knowledge.

Discussion

The present study examined contributors to print knowledge development in preschool children with LI, a population that has only rarely been studied in the HLE literature. Given that young children with LI show early lags in their development of key literacy skills, elevating their risk for future reading difficulties (e.g., Catts et al., 2002), improved understanding of contributors to print knowledge among these children is a necessary pursuit of researchers. Our particular interest was to examine the contribution of two components of the HLE, namely frequency of book reading and literacy teaching during book reading, on children's print knowledge but also to determine whether specific children's characteristics (i.e., oral language ability and print interest) moderated the relation between the HLE and print knowledge. This focus allowed us to explore the interplay between literacy experiences in the home and children's individual differences. A key strength of this work is its strong external validity. The children

represented in this work were drawn from classrooms serving children with disabilities and all have IEPs; thus, the findings may be informative to understanding children served within ECSE programs. We will discuss several key findings which emerged from this work.

Preschool children who are typically developing, on average, correctly identified 17.45 upper-case letters (*SD* = 9.1) and scored 5.48 on the name-writing task (*SD* = 2.0; Invernizzi et al., 2004). Thus, not surprisingly, children in our sample scored lower on these tasks than typically developing children (although their standard deviations were similar indicating comparable levels of wide variability); on average, our sample of children identified 10.37 letters (*SD* = 10.10) and scored 3.13 on name-writing (*SD* = 2.3). However, in other studies by Justice and colleagues with preschool children who have language impairment, our sample scored comparably (McGinty & Justice, 2009; Skibbe et al., 2008b). Justice et al. (2006) reported average raw PWPA scores for children with typical language and language impairment with a further breakdown by SES status. Our sample scored comparably to middle and low SES children with language impairment as well as low SES children with typical language but lower than middle SES children with typical language. Comparing the HLE across studies is challenging because of the differing ways it is conceptualized (e.g., use of composites; categorical responses of minutes per day versus number of times per week). Given this complexity, it appears that our caregivers are reading to their children slightly more often than what is reported in other studies. For instance, Roberts and colleagues (2005) and Foy and Mann (2003) found caregivers read to their preschool children approximately four times per week, while our caregivers reported reading over five times per week. In regard to literacy teaching, caregivers in the present study indicated that they teach children about letters and words approximately three times per book reading session (on a scale of 1-8 times per session). No

other studies to our knowledge have captured caregiver report on the frequency of literacy teaching during a book reading context; however, when asked about frequency in any context, caregivers reported literacy teaching activities approximately "a few times per week" for preschool-aged children (score of 3 on a 1-5 scale; Stephenson et al., 2008) to "sometimes" to "often" for kindergarten students (score of 3-4 on a 1-5 scale; Sènèchal, 2006).

Frequency of storybook reading, but not literacy teaching during book reading, had modest but significant associations with the print knowledge of children with LI. Frequency of reading explained approximately 4% of the unique variance in children's print knowledge after controlling for maternal education and children's nonverbal intelligence. Albeit not consistently so, prior research has documented a relation between frequency of storybook reading and print knowledge (Bus et al., 1995; Fritjers et al., 2000; Kim, 2009; Purcell-Gates, 2001; Sonnenschein & Munsterman, 2002). These findings provide further support for the importance of caregiver-child shared book reading. In a meta-analysis, Bus and colleagues (1995) found that the frequency of book reading explained about 8% of the variance in language growth, emergent literacy, and reading achievement for preschoolers who are typically developing. Although the findings did not control for maternal education, the researchers found that study results did not differ for families who were low SES. The lower level of variance explained in the current study may be attributable to focusing on children with LI and controlling for children's nonverbal intelligence.

Interestingly, literacy teaching during book reading was not a significant predictor of children's literacy skills. This construct has been consistently shown in previous research to be related to children's literacy skills (Evans et al., 2000; Kim, 2009; Purcell-Gates, 2001; Sonnenschein & Munsterman, 2002). We hypothesize that the difference in our findings may be

due to conceptualizing literacy teaching during only one context- book reading. Other studies examining literacy teaching have generally asked parents how often they teach their children about literacy (i.e., in any context).

Much of the prior research examining contributors of the HLE to children's literacy skills has involved children who are typically developing. This study and one conducted by Skibbe and colleagues (2008b) demonstrates that work involving children with LI has failed to fully converge with the literature on children who are developing typically. Skibbe et al. found that the patterns between the HLE and children's literacy development for the total sample of children (including children with LI and typical language) were not replicated with children with LI. As those authors speculated, presence of LI may attenuate the potential impacts of the environment (HLE) on children's early literacy development; it may be that children with LI may not have the requisite skills to benefit from various literacy activities within the home environment. Consequently, we cannot necessarily generalize the features of the HLE that positively affect the development of children who are typically developing to explain the experiences of children with LI. The HLE experiences of children with LI may differ in important ways, not captured in this study, from those of children developing typically.

Although oral language ability and print interest did not moderate the relations between the two components of the HLE and children's print knowledge, they emerged as unique predictors. After controlling for maternal education, children's nonverbal intelligence, and components of the HLE, oral language ability explained a robust 14% of the variance in print knowledge. Print interest was a unique predictor only in the circumstance of holding literacy teaching during book reading, but not frequency of book reading, constant. Thus, our findings generally converge with extant research on children developing typically. In a study with

preschool children with LI, Justice et al. (2003) also found that children who had relatively better oral language skills and who were rated as having high literacy interest showed the largest gains during early literacy intervention.

As has been shown with children who are typically developing (Dickinson et al., 2003; Storch & Whitehurst 2002), we found that preschool children with LI who have stronger oral language abilities evidenced higher levels of code-related skills. In their longitudinal study of 626 children, Storch and Whitehurst (2002) found that children's preschool oral language ability predicted 48% of the variance in code-related skills. Additionally, with a sample of over 1,000 children, NICHD Early Child Care Research Network (2005) found a small direct effect of prekindergarten language on first grade decoding. Such findings suggest that children with lower levels of language skill are at particular disadvantage in developing early literacy skills and hence are at great risk for future reading difficulties.

The role of literacy interest and reading ability is well-established in older children (e.g., Baker & Scher, 2002; McKenna, Kear, & Ellsworth, 1995; Sènèchal, 2006) and shows interesting parallels for emergent readers (e.g., Dale & Crain-Thoreson, 1999; Deckner et al., 2006; Fritjers et al., 2000). Our finding that print interest contributes to emergent literacy skills is an important one because only Skibbe et al. (2008b) and the current study have examined the relation of literacy interest and literacy skills for preschool children with LI. More work in this area needs to be conducted.

Limitations and Future Directions

While this study represents an important expansion of the literature on the relation between dimensions of the HLE and literacy development by focusing on children with LI, a

population highly susceptible for development of reading difficulties, two limitations require mention.

First, we examined the concurrent relations between the dimensions of the HLE and children's print knowledge. Without use of longitudinal methods, we cannot know whether features of children's HLE might have long-term impacts on children's later reading outcomes. Future research should utilize a longitudinal design similar to the work of Sènèchal and colleagues to determine whether home literacy practices exert any lasting effects on literacy outcomes for children with disabilities (Sènèchal & LeFevre, 2003; Sènèchal, 2006).

Second, as with any study, we are constrained by limitations associated with our measurement of key constructs. We relied on caregiver report for our HLE conceptualizations. The importance of caregivers reading with children is emphasized in society, and thus caregivers could be biased to indicate elevated levels of literacy activities with their children. Yet, caregivers in the current study reported the full range of responses, with some caregivers indicating they do not engage in any literacy activities with their children. Also, researchers have found similar results when they utilize caregiver report of frequency of literacy practices (e.g., Evans et al., 2000; Sènèchal & LeFevre, 2003) or proxy measures, such as caregivers' familiarity with children's literature (e.g., Roberts et al., 2005; Sènèchal, 2006). Another measurement limitation pertains to conceptualizing literacy teaching during one specific activity (book reading). Different results may have been found for the contribution of literacy teaching to children's print knowledge if we had not constrained the context of literacy teaching. Future research should include more comprehensive measures to collect in-depth information, using both caregiver report and direct observations, to assess both the frequency and quality of the home literacy environment for children with disabilities.

Conclusion

To summarize, results of this study increase our understanding of the relation between dimensions of the HLE and the early literacy skills of children with LI. First, findings demonstrate that shared book reading frequency may have modest but observable impacts on the literacy skills of young children with LI, even after controlling for maternal education and children's nonverbal intelligence. Second, it demonstrates that children's characteristics, specifically language ability and literacy interest, play a role in understanding individual differences in literacy development. As children with LI are at great risk for reading difficulties and because increased print knowledge contributes to reading progress, it is of critical importance to continue to examine the mechanisms by which children with disabilities develop print knowledge as well as identify which practices are effective in improving these skills.

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Table 1

Descriptive Statistics for Children's Print Knowledge, the HLE, and Child Characteristics

n = 119	Mean	Range	SD
Children's Print Knowledge			
Upper-case alphabet recognition	10.37	0-26	10.10
Name writing	3.13	0-7	2.31
Preschool Word and Print Awareness	5.07	0-16	3.64
Home Literacy Environment			
Read to child last week (frequency of storybook reading)	5.61	1-8	2.28
Child asked to be read to last week (frequency of storybook reading)	4.34	0-8	2.74
Child looked at books on own last week (frequency of storybook reading)	5.11	0-8	2.53
Taught child about letters during last book reading (literacy teaching during book reading)	3.30	0-8	2.80
Taught child about words during last book reading (literacy teaching during book reading)	3.69	0-8	2.70
Child Characteristics (Moderators)			
Child asked family member to write name in the last month (child print interest)	2.92	0-8	3.19
Child asked for help reading word(s) or two in the last month (child print interest)	4.03	0-8	3.32
Oral language ability	78.53	45-116	17.00

Table 2

Correlations between Print Knowledge, HLE, Child Characteristics, and Maternal Education

	2	3	4	5	6	7
1. Print knowledge	.21*	.09	.23*	.55***	.34***	.27**
2. Frequency of storybook reading	--	.43***	.34***	-.01	-.13	.24**
3. Literacy teaching during book reading		--	.27**	-.07	-.03	-.01
4. Child print interest			--	.21*	.18	.-.05
5. Child oral language ability				--	.59***	.20*
6. Nonverbal intelligence					--	-.04
7. Maternal education						--

Note. *p<.05. ** p<.01. *** p<.001.

Table 3

Summary of Regression Model Investigating Relation between HLE and Print Knowledge

		HLE Construct			
		Frequency of Storybook Reading		Literacy Teaching during Book reading	
Block	Predictor	ΔR^2	β	ΔR^2	β
1		.191***		.191***	
	Maternal Education		.28**		.28**
	Nonverbal Intelligence		.35***		.35***
2	HLE Construct	.038***	.20*	.010***	.10

Note. *$p < .05$, ** $p < .01$, *** $p < .001$. Reported β is the standardized value of beta from the corresponding entry block.

Table 4

Summary of Regression Models Investigating Interaction Effects of Child Characteristics and HLE on Print Knowledge

		HLE Construct			
		Frequency of Storybook Reading		Literacy Teaching during Book reading	
Block	Predictor	ΔR^2	β	ΔR^2	β
1		.191***		.191***	
	Maternal Education		.28**		.28**
	Nonverbal Intelligence		.35***		.35***
Print Interest					
2		.053***		.038***	
	HLE Construct		.15		.05
	Print Interest		.14		.18*
3		.001***		.009***	
	HLE* Print Interest		.04		.10
Oral Language					
2		.175***		.155***	
	HLE Construct		.20		.12
	Oral Language		.48***		.49***
3		.007***		.001***	
	HLE *Oral Language		.09		.03

Note. * = $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5

Summary of Regression Models Investigating Relations between Oral Language Ability and Print Knowledge

		HLE Construct			
		Frequency of Storybook Reading		Literacy Teaching during Book reading	
Block	Predictor	ΔR^2	β	ΔR^2	β
1		.191***		.191***	
	Maternal Education		.28**		.28**
	Nonverbal Intelligence		.35***		.35***
2		.038***		.010***	
	HLE Construct		.20*		.10
3		.137***		.145***	
	Oral Language Ability		.48***		.49***

Note. * = $p < .05$, ** $p < .01$, *** $p < .001$.