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Examining the Relations of the Home Literacy Environments of Families of Low SES with Children's Early Literacy Skills

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ABSTRACT

This study examined variability of the home literacy environment (HLE) using multiple measures among families of low SES. The relations of the measures to each other and to children's early oral language skills and print knowledge were reported. Considerable variability of the self-reported HLE items and the Children's Title Checklist (CTC) but low correlations were found among items. Children's expressive language skills were predicted by the CTC. The number of storybooks in the home predicted variance within children's receptive vocabulary. Concepts about Print (CAP) scores were predicted by the primary caregivers' frequency of shared reading and the age when parents began reading to children. Children's letter name scores were not associated with any of the HLE measures in this study. The research provides additional information about the HLE within the homes of low SES using multiple measures and how they relate differentially to children's early language and literacy skills.

Children's early literacy experiences in the home are influential in building foundational skills that are important predictors of later academic success. Exposure to language and print within the home literacy environment (HLE) is related to children's emergent literacy skills, such as oral language, print knowledge, and phonological awareness (Bus, van Ijzendoorn, & Pellegrini, 1995; National Early Literacy Panel, 2008), which predict early reading (Storch & Whitehurst, 2002). Moreover, reading skills and comprehension in later elementary school are predicted by children's early code-related and oral language skills and their earlier elementary reading ability (Quinn, Wagner, Petscher, & Lopez, 2015; Suggate, Schaughency, McAnally, & Reese, 2018).

Children from lower SES households tend to score lower on measures of early literacy upon school entry than do their higher SES peers (Chatterji, 2006; Snow, Burns, & Griffin, 1998). Some studies suggest that the association of family income with child outcomes may be mediated by parent investments in provision of a stimulating HLE (Bennett, Weigel, & Martin, 2002; Inoue, Georgiou, Parrila, & Kirby, 2018). Parents of lower SES reported engaging in HLE practices with their children less frequently than

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higher SES parents (Burgess, Hecht, & Lonigan, 2002; Crosnoe, Leventhal, Wirth, Pierce, & Pianta, 2010). However, 71% of parents below the poverty threshold reported reading with their child at least three times weekly (Corcoran & Steinley, 2017). Moreover, there is considerable variability in the types and frequency of HLE activities among these families (Han & Neuharth-Pritchett, 2015; Phillips & Lonigan, 2009).

These complex findings indicate how important it is to carefully investigate how the HLE is conceptualized and measured. Whereas traditionally studies have relied heavily or exclusively on shared book reading frequency, the use of multiple measures of the HLE likely provides a more complete picture of how children's literacy skills relate to the HLE in the homes of families of low SES. This study explores this question by simultaneously using several distinct HLE measures and evaluating their association with children's skills.

Multiple aspects of the HLE and relations to emergent literacy skills

The HLE includes numerous components, including some like formal teaching that are conceptualized as, and documented as, supporting code-related aspects of emergent literacy, others, like conversations, that are conceptualized as primarily supporting oral language development, and others, like shared book reading, that may support learning in both areas but have stronger evidence supporting the link with language skills (Bus et al., 1995; Hood, Conlon, & Andrews, 2008; Sénéchal, LeFevre, Thomas, and Daley, 1998). The frequency of parent engagement in shared book reading with their children, the focus of the present study, has been the most often studied and most heavily promoted component of the HLE (Burgess et al., 2002; Bus et al., 1995). Evidence suggests that books provide a rich context for language that children may not encounter in everyday speech interactions (Hayes & Ahrens, 1988; Mesmer, 2016; Montag, Jones, & Smith, 2015), thus providing learning opportunities that support language and literacy depth (i.e., through consistent exposure and likely repeated readings of the same books) and, possibly, breadth (e.g., if higher frequency reading also indicates exposure to a greater variety of books). Related components of the HLE representing depth, breadth, or both are the age when parents first began reading to children, the number of books in the home, and library visits (Sénéchal & LeFevre, 2002; Storch & Whitehurst, 2002).

Frequency of shared book reading has consistently predicted children's expressive and receptive vocabulary (Bus et al., 1995; Mol & Bus, 2011; Napoli & Purpura, 2018), but is only sometimes related to alphabet knowledge, concepts of print and phonological awareness (Burgess et al., 2002; Justice & Ezell, 2002). Sénéchal et al. (1998) reported that parents' knowledge of storybooks was correlated with children's concepts of print but only parents' reports of teaching activities predicted children's scores on a written-language factor in a hierarchical regression model. In contrast, Niklas and Schneider (2013) found that a composite HLE measure focused on shared reading and book ownership (but not formal teaching) significantly predicted later vocabulary, phonological awareness, and letter knowledge, albeit weakly. The link between shared reading and code-related skills may hinge on how actively parents focus on print-related concepts while reading with their children (Evans & Shaw, 2008; Martini & Sénéchal, 2012).

The age at which parents began reading to children has been found to predict children's expressive and receptive vocabulary (Sénéchal, LeFevre, Hudson, & Lawson, 1996). Shared reading metrics always include reading by the primary caregiver and sometimes include reading by others in the home (e.g., older siblings, grandparents, live-in partners). Inclusion of reading by multiple household members is particularly relevant for families of lower SES where distributed caregiving may be more prevalent due to nonstandard work schedules (Gassman-Pines, 2011). A related HLE construct is children's access to numerous books within the home, which has been found to predict children's receptive and expressive vocabulary skills and alphabet knowledge (Mol & Bus, 2011; Zill et al., 2003).

Another aspect of the HLE is the frequency of children's visits to libraries and participation in libraries' educational programs. On one hand, particularly for families with limited financial resources, visiting the library may afford access to a greater variety of books. On the other hand, transportation constraints for families of lower SES, particularly in rural areas, may suppress library use (Tichnor-Wagner, Garwood, Bratsch-Hines, & Vernon-Feagans, 2015). The frequency of library visits is correlated with children's concepts of print scores (Zill et al., 2003) and vocabulary (Sénéchal et al., 1996).

Format of HLE measures

In addition to the specific focus of HLE items, another way in which measures vary is in whether they are transparent self-reports or gathered through indirect means; both methods have strengths and limitations. Surveys that directly ask parents to self-report the type and frequency of home literacy activities are most commonly used. These surveys are generally quick and easy to administer. Items typically included, and those analyzed in this study, are the frequency of a parent or other person in the home reading to the child, the number of picture books in the home, the frequency of visits to the library, and the age at which the parent began reading to the child. Individually and in composite, HLE items from self-reported surveys have been found to relate to children's early language and literacy skills (Inoue et al., 2018; Sénéchal et al., 1996).

Although the convenience of self-report surveys is clear, accuracy of the reported information has been questioned. Parents may differentially interpret the concept of reading frequency. One parent might count one reading session with five books read as five occurrences, while another might report the same session as one occurrence (Mol & Bus, 2011). Compared to studies including only frequency, the effect size predicting emergent literacy skills was larger when both items that assessed the frequency of shared reading and the duration of a reading session were included in a composite (Storch & Whitehurst, 2002).

One additional concern relates to the risk of social desirability. Reading to children has been heavily promoted as a positive developmental practice, so parents might be particularly prone to inflate their actual amount of reading frequency when answering a survey question (Hofferth, 2006). Mol and Bus (2011) in particular expressed concern that parents could view questions related to home reading behaviors as a measure of parenting quality and therefore be more likely to answer in a more favorable way, thus introducing social desirability bias. Hypothetically, inflated responses regarding

frequency could attenuate the relation of this measure to children's emergent literacy skills. Respondents also may have difficulty recalling their actual frequency of performing a particular behavior or estimating the information because of memory effects (Morsbach & Prinz, 2006; Schwarz & Oyserman, 2001). Although this too could suppress associations, several studies have reported that parents are often quite accurate with recall and estimation of events (Burns et al., 2001; Eck, Klesges, & Hanson, 1989).

To counter some of the identified concerns with self-report measures, some researchers have turned to indirect self-report instruments. Building on prior author recognition measures for adult readers (Stanovich & West, 1989), Sénéchal et al. (1996) created a similar measure for parents using children's storybook titles (CTC) to assess shared reading with preschool-aged children. The logic of these measures is that parents who read more widely (i.e., indexing breadth) will recognize a larger number of the included titles. The CTC has been used in a number of studies (e.g., Farver, Xu, Eppe, & Lonigan, 2006; Evans, Shaw, & Bell, 2000; Foy & Mann, 2003; Gest, Freeman, Domitrovich, & Welsh, 2004; Hood et al., 2008; Sénéchal & LeFevre, 2002). The measure has been found to correlate with parents' self-reported measures of the HLE (Mol & Bus, 2011; Sénéchal et al., 1996) and has predicted common child early literacy outcomes (e.g., vocabulary; letter names; phonemic awareness; rhyme awareness) over and above self-reported reading frequency scores and the number of books in the home. These findings of a unique relation suggest that the CTC and more traditional measures are capturing somewhat different aspects of the HLE. Furthermore, a meta-analysis comparing studies utilizing a checklist with those using a self-reported survey also indicated larger effect sizes for children's emergent literacy skills for studies using a checklist than those using a single measure of self-reported reading frequency (Mol & Bus, 2011). However, studies utilizing the quantity of books in the home or an HLE composite had similar effect sizes as the checklist, leading to unclear conclusions as to how these HLE metrics uniquely related to one another and children's skills and supporting the need for additional research.

SES and measures of the HLE

Some limitations of HLE measures may be particularly acute for families of lower SES. These parents might be especially vulnerable to social desirability biases as they may feel judged by service or benefits providers. Whereas ostensibly using a CTC might minimize this risk, it has its own potential limitations. A measure such as the CTC and, comparably, a question about the quantity of books owned, could potentially penalize families with less discretionary income to purchase books. These families might have less access to books and therefore less knowledge of a wide array of books but in fact read quite often with the books available. This frequency of exposure would offer children repeated exposures but to a narrower selection of print concepts and words (Whitehurst et al., 1988; Mesmer, 2016) and thus could, hypothetically, attenuate the associations with emergent literacy skills. In addition, because SES is often highly correlated with race, the CTC might introduce inadvertent racial bias. Parents may choose storybooks that reflect their cultural identities or that are written by authors of a similar race and thus be familiar with many books not on the list.

We have scant information on the CTC with lower SES families as most studies conducted to date have included primarily middle-to-upper SES families in their samples; therefore, results may not generalize to families of lower SES (Hood et al., 2008; Sénéchal et al., 1996; Sénéchal & LeFevre, 2002). Only three prior studies utilizing the CTC have obtained samples from families representing lower SES (Gest et al., 2004; Farver et al., 2006; Hamilton, Hayiou-Thomas, Hulme, & Snowling, 2016). Both Farver et al. (2006) and Gest et al. (2004) indicated that despite their samples obtaining lower CTC scores than prior studies utilizing a higher SES sample (e.g., Sénéchal et al., 1996), there was considerable variability among scores. Moreover, in both studies the CTC alone or in composite with other HLE aspects related to children's language skills. Collectively, these and other findings (e.g., Phillips & Lonigan, 2009) suggest that lower SES families are not homogeneous in their home literacy practices and that the heterogeneity among families is associated with children's emergent literacy outcomes. Notably, none of the studies examined the relations between the CTC and children's language skills concurrent with parents' self-reported reading measures. To help mitigate these gaps the sample in the current study focused exclusively on families of lower income and examined the unique and joint associations for several different measures of the HLE.

Purpose of the current study

The present study's goals were to more clearly identify the HLE within homes of families of lower SES and to gain a better understanding of the multiple aspects of the HLE that may be related to children's emergent literacy skill development. Specifically, this study was designed to answer the following research questions: (a) What is the variability of responses on direct and indirect questions related to shared book reading and book exposure when answered by parents of low income? (b) How are parent-reported HLE variables (parent-reported frequency of shared reading, number of books in the home, age when the parent first read to the child, frequency of library visits) related individually and in composite to each other and to the CTC? (c) What is the unique and shared variance of children's expressive and receptive vocabulary, alphabet knowledge and concepts of print predicted by the self-report frequency measures and the CTC?

Consistent with prior findings with families from lower SES backgrounds (Farver et al., 2006; Gest et al., 2004), we predicted variability, rather than uniformly low responses, in all HLE measures. We predicted that parent-reported HLE variables would be related to each other, and to the CTC. In particular, given that both are putative indicators of broad exposure, we expected the quantity of books in the home and the CTC to be substantially correlated. Because of prior findings (Mol & Bus, 2011), and the conceptualization of the HLE items and the CTC as partially but not entirely overlapping in their representations of depth and breadth of language-learning opportunities, all were expected to predict children's vocabulary skills in isolation but not all were expected to be unique predictors when combined. In designing this study, understanding which predictors attained unique variance was of high interest. In contrast, given mixed findings on the relation of informal book exposure to print outcomes, and findings that print knowledge may be more related to home teaching than to shared reading

(e.g., Burgess et al., 2002; Hood et al., 2008), we did not necessarily expect the HLE measures to predict these skills but recognized the possibilities for associations.

Method

Participants

The participants for this study were parents of children enrolled in a study in seven Head Start preschool facilities in the southeastern United States from 1999 to 2002. Head Start is a federally funded preschool program that began in 1965 to ameliorate the effects of children living in poverty. Although the Head Start centers within geographic regions have the flexibility to set area-specific guidelines for program participation, the general guidelines are that the centers serve families whose children are most at risk academically. Children served are typically those with disabilities or those from families with low incomes. In 2002–2003, approximately 909,608 children were enrolled nationally in Head Start programs (U. S. Department of Health and Human Services, 2004).

Written consent forms were completed by all parents of children participating in the study and children were asked verbally if they agreed to participate prior to assessment. Of the 428 children enrolled in the assessment study, 292 parents submitted a survey (68%). Participants whose surveys were missing items of particular interest (i.e., maternal education, CTC) or who were missing child age or at least one child outcome were removed from the dataset leaving 267 total participants. In addition, eleven children had scores that were outliers on the receptive vocabulary measure (i.e., >2 standard deviations below the sample mean) and were also removed from the dataset. The final total sample included 256 participants. Listwise deletion was used when conducting the analyses for items that were not central to the research question (e.g., one of the child assessment scores). The sample sizes for the analyses including child outcomes ranged from 242 to 256 participants. No significant differences were detected among the sample and the parents whose surveys were not included in the dataset due to missing variables. The demographics and children's assessment scores also did not differ significantly for those whose parents' surveys were included and those whose were not.

Surveys were primarily answered by mothers (94%), 60% of whom reported living with a spouse or partner. The families in this study had a mean household income of approximately \$12,486. By way of comparison, the federal poverty guideline in 2000 for a family of four was \$17,050 (Annual Update of The HHS Poverty Guidelines, 2000). The average level of maternal education was equivalent to a high school diploma with 65% of the sample reporting a high school diploma or less and 16% having at least an associate's degree (see Table 1). The children of the parents answering the surveys were predominantly African American (93%) and there were slightly more female (58%) than male children represented in the sample.

Measures

HLE survey

Parents were asked to complete paper surveys related to family demographics and home literacy practices. Most were offered restaurant coupons of small denominations to

Table 1. Descriptive statistics.

	М	SD	Range	Skewness	Kurtosis
Participant demographics					
Maternal education (years)	12.57	1.99	0 to 19	-2.02	14.27
Household income	\$12,486	\$7,597	\$1000 to \$34,000	0.23	-1.05
Other children in home	1.47	1.21	0 to 6	1.08	1.36
Child age (months)	48.39	6.99	33 to 62	0.13	-1.08
% living with a spouse or partner	60%				
% maternal survey respondents	93%				
Child outcomes					
EOWPVT-R	16.63	8.17	2 to 49	0.97	0.94
EOWPVT-R (Standard Score)	82.52	9.72	55 to 123	0.70	2.19
PPVT-R (Standard Score)	77.20	14.91	46 to 113	-0.18	0.17
PPVT-R	24.27	12.19	7 to 69	0.77	0.04
Concepts About Print	3.04	1.87	0 to 10	1.17	1.93
Letter names	3.36	6.57	0 to 25	2.40	4.56
Home literacy environment					
Picture books in home	2.19	1.56	1 to 8	1.68	2.69
Age when began reading to child (months)	7.32	6.08	0 to 48	2.04	9.53
Primary caregiver reads to child (times per week) ^a	3.10	1.82	0 to 6	0.35	-1.06
Other person in home reads to child (times per week) ^a	2.14	1.79	0 to 6	0.82	-0.21
Library visits (times per month)	.89	1.36	0 to 6	1.96	3.82
Total book titles identified from original CTC	4.27	3.99	-4 to 17	1.07	0.74
(real titles – fake titles)					
Total book titles identified from extended CTC	5.40	5.76	-3 to 35	1.84	4.59
(real titles – fake titles)					

Notes. N = 256. Scores are raw scores unless noted as standard scores. EOWPVT-R = Expressive One Word Picture Vocabulary Test – Revised; PPVT-R, Peabody Picture Vocabulary Test – Revised; CTC, Children's Title Checklist.

^aThe responses for these questions were from a 0 (never) to 6 (almost daily) scale.

complete the survey. Families were enrolled into the study, and surveys were collected from parents over the course of three consecutive years. In some cases, parents completed the survey in more than one year, but unless data central to the research questions were missing, only the first year's survey was used in the analysis. Approximately 9% of surveys used were the 2nd survey the parent completed.

This study analyzed questions related to parent's reported number of picture books owned, the age in months the parents began reading to the child (reverse-coded so that a higher age actually received a lower score in the analyses), the number of times per week the parent read to the child, the number of times per week another person in the household read to the child, and the number of times per month the child visited the library. Between years, the survey question that asked families how many picture books they owned changed from an open-ended format to a 9-point Likert scale with ranges (i.e., 1 = 1-20, 2 = 21-40, 3 = 41-60, 4 = 61-80, 5 = 81-100, 6 = 101-150, 7 = 151-200, 8 = more than 200). For the analyses, the open-ended questions were converted to the scale ranges. The mean for this item was calculated by using the midpoint of the scale ranges or the actual number if provided by the parent.

СТС

A slightly modified version of the Sénéchal et al. (1996) CTC was administered to the parents. The original CTC included 38 real (e.g., *The Very Hungry Caterpillar, Where the Wild Things Are, A Pocket for Corduroy*) and 22 fake titles (e.g., Terry Toad, How Stephen Found a Pet). The book titles were selected to be widely available to all

socioeconomic subgroups and included a range of books that were generally well-known (e.g., *The Pokey Little Puppy* and *Goodnight Moon*).

In addition to the original book titles developed by Sénéchal et al. (1996), 28 real and 5 fake titles were added to the original version of the CTC to include books that might be more culturally relevant to the participants in this sample who were primarily African American (e.g., *Harriet and the Promised Land* and *The Patchwork Quilt*). A total of 88 book titles were provided to assess parents' familiarity with the book titles. Parents were informed that the list contained both real and fake titles. Two totals were calculated by subtracting any fake titles checked from the total real book titles the parent identified for both the original CTC and the modified version. A negative score was possible if a participant selected more fake titles than real titles. The Spearman Brown coefficient for the original CTC was .89 and .92 for the modified version.

Children's language and literacy assessments

Children were given a battery of assessments in the fall as part of ongoing longitudinal assessment projects. Assessments were conducted in multiple sessions over a two to three week period. Selected measures for this study included those that have been related to constructs within the HLE in previous studies. Children's expressive vocabulary was measured using the Expressive One Word Picture Vocabulary Test - Revised (EOWPVT-R; Gardner, 1990) assessment. This assessment required children to provide a name for an object as seen in a picture. Receptive vocabulary was measured using the Peabody Picture Vocabulary Test - Revised (PPVT-R; Dunn & Dunn, 1981) which asked children to point to the picture that matches a word the assessor provided. Children's knowledge of print concepts was assessed using an abbreviated version of the Concepts About Print (CAP) Test (Clay, 1979). Although the CAP Test was normed for an older sample, prior studies have used the original version with children three to four years of age and found variability within children's scores and relations to other early literacy skills (e.g., Lomax & McGee, 1987). Only the "Sand" subtask of the CAP Test was used, which asked children to identify basic features of written text and books (e.g., location of book title, direction of print on a page). Items related to punctuation were intentionally removed because those items were not deemed as age appropriate for this sample. The identical adapted version was used in prior studies (Lonigan, Burgess, & Anthony, 2000; Phillips, Lonigan, & Wyatt, 2009) and Sénéchal et al. (1998) used a similar adaptation with moderate reliability.

Children's knowledge of letter names was measured by showing children pictures of 25 uppercase letters (the letter "W" was inadvertently omitted from the task) in a standardized but non-alphabetical order and asking them to provide the letter name. A ceiling rule was imposed when a child failed to correctly identify five consecutive letter names. A study using the same measure with a different sample indicated a 3-month test-retest reliability correlation of .85 (Lonigan, Purpura, Wilson, Walker, & Clancy-Menchetti, 2013). Because not all children's assessments had standardized scores, the raw scores were used and child age in months at test date was included as a control variable in all analyses.

Results

Preliminary analyses

Item mean, standard deviation, and normality were first examined and reported in Table 1. Our first research question was whether there was variability of scores among a group of families within a restricted, and quite low, range of incomes. Based on the results of the analysis, the hypothesis that there would be considerable variability was supported (see Table 1). For example, the percentage of primary caregivers reading to children was 21% reading once a week or less, 54% reading two to four times per week, and 25% reading five times a week or more. Although 56% of parents reported never going to the library, 21% went once per month and 23% went two or more times a month. The scores on the CTC were fairly normally distributed with 16% of parents identifying no real book titles, 74% identifying between one and ten real titles, and 10% identifying more than ten books.

Before continuing with further analyses, the two versions of the CTC were examined. When the additional books from the modified CTC were included in the analyses, the mean score and the range of the CTC increased slightly (see Table 1). A correlational analysis revealed that the scores of the original CTC list and the extended version of the CTC were highly correlated, r (265) = .93, p < .001. Given the similar means and the high correlation, which indicated that the additional books did not make the booklist more relevant to the sample, only the scores from the original CTC were included in further analyses.

Zero-order and partial correlations among HLE variables

Our second research goal was to assess how the HLE items related to one another. Bivariate and partial correlations (controlling for age) are reported in Table 2. Many of the HLE items were not significantly correlated with other HLE items. The self-reported frequency with which the primary caregiver read to the child was significantly and positively correlated with each of the other self-reported shared reading activities except for the CTC and the earliest age at which the primary caregiver began reading to the child. The CTC scores were positively and significantly correlated to the number of picture books owned. The frequency of a parent reading to the child and the frequency of library visits were most highly correlated. Given the relatively weak item correlations, no composite among the HLE items was justified and all predictive analyses were conducted with the CTC and individual HLE items. Although multiple comparisons create a higher risk of Type I error, assuming a medium effect size, the sample size in the current study was sufficiently high to limit the risk of rejecting a true null hypothesis (Faul, Erdfelder, Buchner, & Lang, 2009). Because raw scores were used for the children's outcomes, partial correlations were also conducted controlling for child age in months (See Table 2).

Predicting child outcomes from home literacy variables

To answer the third research question, linear regressions predicting children's early language and literacy skill outcomes were conducted. Although students were nested within

	1	2	3	4	5	6	7	8	9	10	11	12
1. Child age	_	_	_		_		_	_			_	_
2. Maternal education	06		06	.15*	.05	.13	04	.07	.10	.05	10	.19*
3. Picture books in home	.09	.04	_	.18*	.10	04	.04	.23**	.13	.21**	.04	.23
 Primary caregiver reads to child^a 	11	.18*	.21**	—	.19*	.23**	.09	.06	.13*	04	11	.09
5. Other person reads to child ^a	10	.06	.11	.20*	_	.06	.07	.07	02	05	.02	05
6. Library visits ^b	.01	.14*	.00	.24**	.04	_	10	.10	.06	.03	10	.02
7. Age when parents began reading	09	03	.03	.10	.07	10	_	.19*	.04	.06	.16*	.10
8. CTC Score	10	.04	.20**	.06	.11	.07	.17*	·	.24**	.17*	.12	.09
9. EOWPVT-R	.55**	.07	.14*	.04	07	.05	03	.12	_	.63**	.17*	.19*
10. <i>PPVT-R</i>	.56**	.03	.22**	09	06	.03	00	.07	.75**	_	.09	.12
11. Concepts About Print	.26**	10	.05	11	01	08	.11	.10	.29**	.24**	_	.15*
12. Letter names	.32**	.18*	.12	.07	08	.05	.07	.04	.30**	.26**	.22*	_

Table 2. Bivariate and partial correlations between socioeconomic variables, home literacy, and children's outcomes.

Notes. Bivariate correlations below the diagonal and partial correlations controlling for child age above the diagonal. EOWPVT-R, Expressive One Word Picture Vocabulary Test – Revised; PPVT-R, Peabody Picture Vocabulary Test – Revised. ^aWeeklv.

^bMonthly.

**p* < .05.

 $p^{*} < .001.$

centers, the benefit of multilevel models depends both on the amount of variance explained by clustering and on the soundness of the statistical estimates that can be derived from these models considering the number of clusters and number of participants per cluster. Simulation studies indicate that at least 30 level-two units (i.e., schools) are needed to model level-two effects adequately (e.g., Maas & Hox, 2005).We conducted analysis of unconditional models to calculate the ICC, which identified the variance explained by the students' centers. The ICC's were very small (e.g., $\rho = 0.02$) so we elected not to use multilevel modeling with so few center units (i.e., seven).

Multiple linear regressions were conducted to examine the ability of the HLE items to predict children's outcomes typically associated with early shared reading and exposure to print. Separate regressions were conducted with each of the children's outcomes (i.e., expressive vocabulary, receptive vocabulary, concepts of print, and letter names) as the dependent variables and child age, maternal education, the CTC score, the selfreported number of pictures books owned, the weekly frequency of a primary caregiver reading to the child, the weekly frequency of another person in the household reading to the child, the number of monthly library visits, and the age at which the parent began reading to the child as independent variables. Mother's education was included as a control variable because of its typical correlation with shared reading practices (Farver et al., 2006). These analyses were examined for significant predictors. The age of the child, mother's education and any independent variable with a significance level less than p = .10 were retained. All regression analyses were then conducted again to determine the variables' unique and joint contribution to the variance of the children's language and literacy skills. Results for the oral language outcomes are presented in Table 3 and results for print-related outcomes are presented in Table 4.

The initial model predicting children's expressive vocabulary based on the *EOWPVT*-R assessment accounted for significant variance in this outcome, $R^2 = .38$, F (8, 223) = 16.79, p < .001. The CTC score was the only significant HLE variable and was included

		Expressive One Word Picture Vocabulary Test – Revised							Peabody Picture Vocabulary Test – Revise						
	Model with all predictors			Model with retained predictors			Model with all predictors			Model with retained predictors					
	В	SE	β	В	SE	β	В	SE	β	B SE		β			
Child age	.58	.05	.58	.57	.05	.58**	.56	.05	.55**	.53	.05	.53**			
Maternal education	.08	.05	.08	.10	.05	.10	.07	.05	.07	.07	.05	.07			
Picture books in home	.06	.06	.06	_	_	_	.18	.06	.18*	.18	.05	.18*			
Primary caregiver reads to child ^a	.07	.06	.07	_	_	_	10	.06	10	08	.05	08			
Other person reads to child ^a	04	.05	04	_	_	_	04	.05	04	_	_	_			
Library visits ^b	.02	.06	.02		_	—	.06	.06	.06	_	—	—			
Age when parents began reading	.01	.05	.01	—	—	—	.05	.05	.05	—	—	—			
CTC Score	.16	.06	.16*	.18	.05	.18*	.07	.05	.07	_	—	_			

Table 3. Regressions predicting children's oral language skills from home literacy variables.

Note. CTC, Children's Title Checklist.

^aWeekly.

^bMonthly.

*p < .05.

^{**}p < .001.

Table 4. Regressions predicting children's print knowledge skills from home literacy variables.

			Concepts	about Pr	Letter Names							
	Model with all predictors			Model with retained predictors			Model with all predictors			Model with retained predictors		
	В	SE	β	В	SE	β	В	SE	β	В	SE	β
Child age	.26	.06	.26**	.25	.06	.25**	.33	.06	.33**	.33	.06	.33**
Maternal education	09	.06	09	08	.06	08	.19	.06	.18*	.20	.06	.20*
Picture books in home	.04	.07	.04	_	—	_	.04	.07	.04	_	—	_
Primary caregiver reads to child ^a	16	.07	16*	14*	.06	14*	.05	.07	.05	_	—	_
Other person reads to child ^a	.05	.06	.05	_	—	_	09	.06	09	_	—	_
Library visits ^b	04	.07	04	_	—	_	01	.07	01	_	—	_
Age when parents began reading	.15	.06	.15*	.16	.06	.16*	.09	.06	.09	_	—	_
CTC Score	.06	.07	.06	_	—	_	.05	.07	.05	—	—	_

Note. CTC, Children's Title Checklist.

in the final model. It continued to predict significant variance within children's expressive vocabulary, $R^2 = .35$, F(3, 247) = 43.66, p < .001. As shown in Table 3, the initial model predicting children's receptive vocabulary using their *PPVT-R* scores significantly predicted a moderate amount of variance overall, $R^2 = .38$, F(8, 226) = 17.30, p < .001. The number of picture books owned and the primary caregiver's frequency of reading to the child met the criteria of significance at the p < .10 level and were entered subsequently in the trimmed model. The trimmed model was significant and explained a moderate amount of variance in children's *PPVT-R* scores, $R^2 = .35$, F(4, 247) = 32.97, p < .001.

The initial model predicting CAP scores was significant although it explained a relatively small amount of variance, $R^2 = .14$, F (8, 222) = 4.42, p < .001. How frequently the primary caregiver read to the child and the age when the parents began reading to

^aWeekly.

^bMonthly.

^{*}p < .05. **p < .001.

the child were significant predictors of variance. In the trimmed model, both variables continued to predict significant variance in children's scores on the *CAP* assessment (see Table 4; F [4, 232] = 7.71, p < .001, $R^2 = .12$). Finally, the initial model predicting children's letter name scores was significant and accounted for a modest amount of variance, $R^2 = .15$, F (8, 222) = 5.03, p < .001. Only child age and maternal education predicted unique significant variance of children's letter name knowledge. Thus, no HLE variables significantly predicted children's LN scores.

Discussion

The main purpose of this study was to examine the relations of various aspects of the HLE, as represented by distinct measurement tools, to children's early language and literacy skill development among families of preschool-age children with very low income levels. Parents' self-reported aspects of the HLE and a CTC were included in correlations and regression analyses to identify their relations to each other and to children's oral language and print knowledge. Our results indicated that among parents of similar SES, the HLE is associated with children's language and literacy skills and considerable variability exists within the HLE. Evidence of heterogeneity within a lower-SES sample was not an unexpected finding and supports prior research (Gest et al., 2004; Phillips & Lonigan, 2009; Zill et al., 2003). However, our research adds to the literature by demonstrating that, within a lower-SES sample, the questions asked of parents to assess the types and frequencies of HLE activities may provide different and complementary results as they relate to children's emergent literacy outcomes.

We did not find support for our hypothesis that self-reported HLE measures would be highly correlated with each other and with the CTC. Because previous researchers identified significant correlations between parents' self-reported HLE items and parents' familiarity with children's book titles (Mol & Bus, 2011; Sénéchal et al., 1996), we expected the two instruments to measure related aspects of the HLE. Although these items are sometimes used interchangeably to assess the HLE, current results indicate that items are not redundant measures of the HLE among this population of very low SES. We do note that weak relations might also be explained by measurement error within this population, leading us to interpret the results with caution and call for further examination.

Our results provide further indication that measures that have been traditionally used to assess the materials and activities associated with informal reading within the larger HLE tap similar yet unique constructs. Direct questions about books owned and shared reading frequency and the CTC related differentially to children's emergent literacy outcomes, with each explaining a small to moderate amount of variance in distinct skills within this lower-SES population. These results are generally consistent with conclusions from Sénéchal et al. (1996, 1998) regarding the associations of measures related to informal reading practices and children's emergent literacy skills. Specifically, the present results are consistent with Sénéchal et al. (1998) in finding significant predictive relations for the CTC but differ somewhat from these authors' earlier conclusion that direct questions about shared reading or books in the home have limited predictive value. Although more narrowly focused on informal reading aspects of the HLE, our results

also are consistent with the general consensus view (e.g., Burgess et al., 2002; Sénéchal et al., 1998) that the broader HLE is multi-dimensional and that specific elements within the HLE have differential associations with varied emergent literacy skills.

The hypothesis that HLE measures would relate to expressive vocabulary was supported, with unique relations for the CTC. This finding is consistent with prior research and indicates a pattern of results for these families of very low SES comparable to what is seen for middle-income families (Bus et al., 1995; Mol & Bus, 2011; Sénéchal & LeFevre, 2002). Knowledge of a wide variety of books likely indicates that the children are exposed to a breadth of books. The CTC might also represent some aspect of depth, in the form of repeated exposure to novel words across contexts. That is, parents are likely to accrue accurate knowledge of book titles through repeated readings of these books, which then, ostensibly, translates to repeated exposure to the words in those books for their children. Research has emphasized both breadth of words and depth of exposure to words as supportive of children's expressive vocabulary (McKeown, Beck, & Sandora, 2012; Perfetti, 2007).

Our hypothesis that the number of books in the home, the CTC, and the number of library visits per month would predict children's receptive vocabulary was partially supported. Children's receptive vocabulary was predicted only by the number of picture books owned. Sénéchal et al.'s (1996) study had the opposite finding such that whereas the CTC was a significant predictor, the number of books in the home did not predict significant variance in children's receptive language skills. The number of library visits per month predicted additional variance in receptive vocabulary scores in Sénéchal et al. (1996) but not in the current study. These differences in findings may relate to the SES characteristics of the two different samples, but additional studies that incorporate middle- and lower-SES groups in the same study are needed. Of course, none of the current HLE measures specifically identify the frequency with which any single book is read, nor do they capture information regarding the linguistic content of the books read by different families. Future research is needed to explore in more detail the relations between single and repeated exposure to specific books and children's language skills.

The finding that the CTC uniquely predicted children's expressive vocabulary and the number of books owned uniquely predicted children's receptive vocabulary seems to indicate that the two measures may capture slightly different aspects of the HLE. Simply reading storybooks has been shown to increase children's receptive vocabulary whereas children's expressive vocabulary shows more gains through didactic interactions during shared reading (Sénéchal, 1997). Therefore, it seems possible that the CTC may capture an element of parent interaction while reading or repeated readings of the same book, both of which are known to support word learning (Lonigan et al., 2013; Whitehurst et al., 1988). Future research that directly associates CTC scores with patterns of interactivity during reading would shed light on this possibility. Further research also is required to better understand why results might differ for expressive and receptive vocabulary given their conceptual and empirical overlap (e.g., Lonigan & Milburn, 2017). Findings of differential associations for the CTC and number of books owned might also be related to SES as other studies that have examined factor structure among HLE items have found that the CTC score and number of storybooks owned loaded on one factor when examined among families of higher SES (Zhang et al., 2018) but did not load onto the same factor in a study that included a large number of families of lower SES (Hamilton et al., 2016).

Unlike in some prior studies, the number of library visits did not predict variance in any child outcome in the current study. However, the mean number of library visits in Sénéchal et al.'s (1996) study, (M = 3.1, SD = 1.3) which did find this relation, was quite a bit higher than the mean in the current study. The restricted range of library usage in the current study might at least partially explain the lack of relation between the library visits and children's outcomes. The SES of Sénéchal et al.'s (1996) sample was higher, with most parents reporting at least some college and participants also may have been located in a slightly more urban location than the current sample. As Tichnor-Wagner et al. (2015) noted, library usage, while impactful, can still be limited for lower SES families, particularly in rural areas because of transportation challenges. Additional research is needed to determine how distance affects frequency of library usage as well as how families of low SES utilize library resources.

The relations of parents' reading frequency to children's concepts of print was somewhat unexpected given mixed prior findings on whether informal reading practices predict code-related outcomes (e.g., Burgess et al., 2002; Hood et al., 2008) and prior findings suggesting that specific teaching practices during shared reading, rather than just reading itself, were supportive of children's print knowledge (e.g., Han & Neuharth-Pritchett, 2015; Justice & Ezell, 2002). Thus our findings offer additional insight into how book exposure in families of lower SES may support children's understanding of basic print conventions. As noted by Martini and Sénéchal (2012), parents often use storybooks, along with other natural contexts, to teach print skills. Therefore it seems plausible that the parents in the current study may also include some formal printfocused instruction in their reading sessions. Further research is needed to identify whether exposure alone, or exposure in conjunction with more explicit teaching practices, best predicts this skill area.

Finally, the results of our analyses supported our expectation that the shared reading variables and the CTC would not predict children's letter name scores. There are two potential explanations for this finding. One, consistent with some prior findings (e.g., Sénéchal et al., 1998) is that indicators of shared reading activities, and these activities themselves, may not support children's letter knowledge. More formal teaching experiences within or outside of the book reading context (e.g., explicit labeling of individual letters in books or with other alphabet materials) may be needed. However, because we found a relation between reading frequency and children's concepts of print, it seems plausible that the very low letter name scores in the study potentially suppressed relations for the self-reported HLE variables or the CTC to predict variance in this skill. Future investigations, especially controlled intervention studies where HLE practices are manipulated, are required to discriminate between these possibilities.

Limitations and suggestions for future research

Although the finding of significant associations for most of the HLE items with one or more child outcomes provides valuable information about the HLE within very low income samples, this very sampling plan may have led to some limitations in the

findings. The sample in this study represented a population of lower SES than reported in most previous studies; not surprisingly, the data revealed some differences. There were lower than average scores on all child outcomes and also relatively low scores on the self-report and CTC measures of home literacy. The same parent measures were examined in a larger, more diverse sample, inclusive of the current sample, and yielded consistently higher scores in each of the individual shared reading items and CTC scores (Burris, Phillips, & Lonigan, 2012). The mean of the CTC scores was lower than those reported among higher SES samples (Sénéchal et al., 1996; M = 10.95, SD = 5.54and Sénéchal & LeFevre, 2002; M = 17.2, SD = 7.4). However, despite a lower overall mean CTC score, the present sample clearly produced a wide range of scores on this measure, indicating meaningful heterogeneity in HLE practices within a sample of relatively homogeneous demographic characteristics.

The mean of the children's *PPVT-R* scores was also lower than that reported previously in studies of the HLE (Sénéchal et al., 1996; M = 103.9, SD = 11.7). The restricted outcome scores, and somewhat restricted parent scores, may have led to weakened predictive relations for receptive vocabulary but do capture the experience of many children from lower-SES backgrounds as considerable evidence suggests that children with lower SES backgrounds are frequently below average on vocabulary measures upon school entry (Chatterji, 2006; Hecht, Burgess, Torgesen, Wagner, & Rashotte 2000).

As noted earlier, one particular weakness in current measurement tools appears to be that measures are not capturing the frequency with which specific books are read. For example, if parents read with their child each night before bed, are they reading a different book each night or are they reading the same book or small set of books consistently? Knowledge of the diversity of words to which children are exposed and the frequency with which they encounter the words might help explain some aspects of children's early language and literacy skill development.

The current study examined limited types of home literacy materials and experiences (e.g., shared reading of storybooks) and therefore did not fully encompass other types of literacy materials (e.g., magazines or electronic media) and activities (e.g., oral story-telling, formal teaching activities) that might be experienced and that are important aspects of the broader HLE. Additional methods of measuring the HLE, such as observations within the home or questions related to teaching practices utilized during and outside of shared reading sessions, would also provide a more complete picture of the types of activities taking place and how those might relate to children's skill development.

Selection bias might also have been a limitation in the study as a moderate percentage of surveys were either not received from a parent or were incomplete. Although we conducted analyses on the child data associated with those cases that were removed and found no mean differences between the children's scores who were included in the sample, we were unable to identify potential differences in parents. However, given that there was considerable variability within the sample of families who participated, it seems unlikely that only highly engaged parents were included. A related possible limitation of this study is that all children whose parents completed surveys were enrolled in the Head Start program. Therefore, some responses might have been influenced by education offered to parents through the programs' parent outreach efforts. However, the parent surveys were collected as early as possible within the school year. It is unknown whether children were previously enrolled in childcare settings that might also have provided parents with book knowledge (e.g., Early Head Start). Finally, the survey respondents in this study were primarily African American and so the results cannot necessarily be generalized to all lower SES populations as there may be some confounding of SES and racial differences. Some HLE practices and associations captured in the current sample may have more to do with the cultural context of the families than with their SES context, per se (Gardner-Neblett, Pungello, & Iruka, 2012). Future research is needed on racially and ethnically diverse samples of very low SES to explore how to best characterize the HLE among families of lower SES and the relations between these practices and children's emergent literacy skills.

The significant amount of variability for the CTC scores and for other HLE measures within a sample of respondents with relatively homogeneous incomes and educational levels supports prior findings that although income and parental education are correlated with the HLE, there are additional factors that also determine parents' practices (Hindman & Morrison, 2012; Martini & Sénéchal, 2012; Phillips & Lonigan, 2009) that should be explored. For example, as discussed by Rowe (2008) and others, parents' beliefs in the importance of reading to children, knowledge of child development, and parent and child interest in reading may also be contributing to parents' participation in these types of activities with their children and would be a worthwhile avenue to examine further.

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