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Home-literacy environment of low-income rural families: Association with child- and caregiver-level characteristics

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ABSTRACT

The aim of this study was to examine the nature and interrelatedness of four active dimensions of the home-literacy environment of low-income rural families (parent-child interactions, child interest, library use, and access to books) and to determine the extent to which characteristics of the caregiver and child predict these dimensions. Caregivers of 466 preschool-aged rural children completed a questionnaire regarding the home-literacy environment and demographic information regarding individuals in the household during the fall of the academic year. Children were also administered a language measure within the same time frame. Apart from library use, there was significant variability in rural children's engagement in the various dimensions of the home-literacy environment. The home-literacy environment of rural children was significantly associated with caregivers' maternal education, income level, and history of reading difficulty as well as children's language ability and gender. These findings may better enable policymakers to target programs towards children most at-risk of experiencing impoverished home-literacy environments.

Engaging children in enriched home-literacy environments is critical to the acquisition of various cognitive and language skills (Burgess, Hecht, & Lonigan, 2002; Downer & Pianta, 2006; Foster, Lambert, Abbott-Shim, McCarty, & Franze, 2005; Miller, Votruba-Drzal, & Setodji, 2013; Sénéchal, Lefevre, Thomas, & Daley, 1998; Storch & Whitehurst, 2001). Yet, low-income rural children are consistently identified as experiencing limited home-literacy environments in comparison to their peers which makes them more susceptible to later academic difficulties (Baroody & Diamond, 2012; Bailey, 2014; Bus, van IJzendoorn, & Pellegrini, 1995; Curenton & Justice, 2008; Farver, Xu, Eppe, & Lonigan, 2006; Froiland, 2011). These deleterious effects are further exacerbated by the underdeveloped infrastructure and limited institutional resources that typify rural communities (Burchinal, Vernon-Feagans, & Cox, 2008; Burton, Lichter, Baker, & Eason, 2013; De Marco & Vernon-Feagans, 2013; O'Hare & Johnson, 2004). Furthermore, the geographic isolation of rural areas often leads to children in these communities having limited access to outside influences that may promote their cognitive development (Vernon-Feagans & Cox, 2013). Taken together, the unique context of rural areas underscores the continuous need to examine these communities to better understand how poverty influences the experiences of rural children and their families.

Although limited, the studies that exclusively examine families in rural areas provide clear evidence that children in these communities are exposed to and engaged with diverse aspects of the home-literacy environment (Curenton & Justice, 2008; Tichnor-Wagner, Garwood, Bratsch-Hines, & Vernon-Feagans, 2016). Less well understood are the factors that either promote or interfere with the literacy-based activities and resources that are made available within rural households. Viewed from a bio-ecological perspective (Bronfenbrenner & Morris, 2006), the personal characteristics of both the caregiver and the child may influence the home-literacy environment. To date, though, researchers have mainly focused on socio-economic markers as predictors of rural families' home-literacy environment and have largely ignored other caregiver characteristics, such as their history with reading difficulty. Furthermore, these scholars have excluded from their examination whether children's characteristics including age, gender, and language ability may predict the home-literacy environment of rural children. Identifying broader contextual factors that influence rural families' engagement in the home-literacy environment may enable policymakers to critically examine existing programs' strengths and weaknesses and better target services towards children most at-risk of experiencing poor developmental outcomes.

Home-literacy environment

The concept of the home-literacy environment has evolved over time to reflect the myriad of ways that families can contribute to children's development (Burgess et al., 2002; Foy & Mann, 2003; Hiebert, 1980; Mckool, 2007; Storch & Whitehurst, 2001; Sy, Gottfried, & Gottfried, 2013). This construct broadly represents the attitudes, activities, and opportunities provided by families that support children's

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language and literacy development (Brown, Byrnes, Watson, & Raban, 2013; DeBaryshe, 1995; Gottfried, Schlackman, Gottfried, & Boutin-Martinez, 2015; Griffin & Morrison, 1997; McGeown et al., 2015; Scher & Baker, 1994; Wigfield & Guthrie, 1997). Scholars typically distinguish the home-literacy environment as either *active* or *passive* (Bracken & Fischel, 2008). The active home-literacy environment involves children's direct participation in and exposure to literacy activities and are reflected by, for example, shared storybook reading and singing songs. Contrastively, the passive home-literacy environment refers to children's indirect learning through observation of family members' reading behaviors and beliefs. In general, the active home-literacy environment is a stronger predictor of children's emergent literacy outcomes (Burgess et al., 2002). Accordingly, we focus on these activities and resources in measuring the home-literacy environment. More specifically, the present study defines this construct by utilizing four theoretically derived active dimensions of the home-literacy environment: (a) *parent-child interactions*, (b) *child interest*, (c) *library use*, and (d) *access to books*.

Parent-child interactions is perhaps the most frequently studied dimension of the home-literacy environment. This dimension is used to refer to the literacy interactions that occur between caregivers and their children at home (Korat, Klein, & Segal-Drori, 2007; Schmitt, Simpson, & Friend, 2011; Sonnenschein & Munsterman, 2002). The frequency with which children participate in shared storybook reading with an adult is a cornerstone activity within this dimension (Bus et al., 1995; Payne, Whitehurst, & Angell, 1994). Studies investigating these interactions consistently demonstrate the positive association between the frequency of shared storybook reading and children's development of early literacy and language skills (Burgess, 2011; Sénéchal & Cornell, 1993). Scholars also include storytelling and singing songs as additional aspects of parent–child interactions, citing their relation to children's development of phonological and print-related skills (Baker, Scher, & Mackler, 1997; Hammer, Farkas, & Maczuga, 2010).

Child interest is another well-cited dimension in the home-literacy environment literature (Baroody & Diamond, 2013; Martini & Sénéchal, 2012; Scarborough, Dobrich, & Hager, 1991; Sparks & Reese, 2013). This dimension is often measured by caregivers' report on how often children choose to engage in literacy-related activities and the extent to which they exhibit enjoyment during shared storybook reading. Previous studies demonstrate that young children who read to themselves and who pretend to read and write, demonstrate more advanced text comprehension and grammar skills, a greater breadth of vocabulary, and higher levels of reading achievement than children who do not engage in such activities (Justice, Logan, Işıtan, & Saçkes, 2016; Sparks, Patton, & Murdoch, 2014; Yeo, Ong, & Ng, 2014). There is also evidence to suggest that children who enjoy literacy-related activities may be more likely to engage independently in these activities which, in turn, increases their opportunity to practice and enhance their emergent literacy skills (Baroody et al., 2013).

L*ibrary use* is also recognized as an important dimension of the home-literacy environment. Indeed, the public library is an important setting by which parent-child reading interactions may be facilitated (Saracho, 1999). When children go the library, they can access more of a variety of books than what may be offered at home. In the current study, this dimension is operationalized as the frequency with which caregivers visit the library and the number of books typically checked out within a given month. Numerous studies have established that children who frequent the library more often and who regularly check out books demonstrate more advanced language and literacy skills than children who do not (Sénéchal & Lefevre, 2002; Whitehead, 2004).

Finally, children's early exposure to print materials, known as the dimension of *access to books*, is associated with their acquisition of advanced language and literacy skills. Access to books is used to refer to the number of books made available within the household and the age at which children are first read to by their caregivers. Important to note is that the amount of print materials within the home is made separate from the dimension of library use because children are often limited in the number of books that may be checked out from the library at any given time (Burgess, 2011; Johnson & Donham, 2012; Ramos & Krashen, 1998). Prior studies demonstrate that children who are exposed to reading earlier tend to display more advanced language and literacy abilities than children who are read to at an older age. (Gottfried et al., 2015). Moreover, in comparison to children with fewer such resources, those who have access to more books within the home are more likely to engage in shared storybook reading and to engage themselves with these materials than children whose home provide fewer opportunities (Bracken et al., 2008).

Children in rural low-income areas

Rural areas are typically defined as any population, housing, or territory not included within urbanized areas or clusters. Under this definition, approximately 20% of the United States' population live in rural counties and nearly every state contains rural areas (U.S. Census Bureau, 2012). Rural classifications also include measures of population density and proximity to larger urban areas. Although rural areas are not uniformly distributed, these communities are further characterized by low density and highly dispersed populations in which many reside in small towns and villages (Rivers, 2005).

Despite common views of poverty, rates for children living in rural communities are persistently higher than those of children living in urban areas (O'Hare & Johnson, 2004). The disparity of poverty rates in rural areas is due largely to the scarcity of jobs, especially those that offer high-wages, and the out-migration of educated young adults to urban areas (Johnson, Showalter, Klein, & Lester 2014). Furthermore, rural areas have less access to social services and other wrap-around services that serve low-income families (Belanger & Stone, 2008; Chertow, 1968). These conditions often generate interrelated economic and social structures that continue the cycle of poverty including long-term unemployment, lower parental educational attainment, higher incarceration rates, and an increased likelihood of single-parent status (Vernon-Feagans, 2013; Vernon-Feagans & Cox, 2013).

Further complicating these concerns is the accessibility of cognitive developmental resources and agencies in rural areas. Due to geographical dispersion, families living in rural areas are less likely than their urban counterparts to have access to cognitively stimulating resources such as libraries, zoos, and museums (Froiland, 2011). In addition, children in rural communities are more likely to receive care from relatives and to attend home-based care arrangements that often lack stimulating learning and play materials (Bratsch-Hines, Mokrova, & Vernon-Feagans, 2017; Grace et al., 2006; Henning-Smith & Kozhimannil, 2016). This is particularly concerning given that access to high-quality child care may buffer the deleterious effects of poverty on children's reading development. Poverty is less strongly associated with poorer child outcomes when children attend high-quality child care centers than when children do not enroll in these centers (Li, Farkas, Duncan, Burchinal, & Vandell, 2013; Ruzek, Burchinal, Farkas, & Duncan, 2014). In combination, the lack of access to quality community- and school-based learning environments in low-income rural settings may create the context for greater developmental challenges for rural children than their poor urban and suburban counterparts.

Predictors of the rural home-literacy environment

From a bio-ecological perspective (Bronfenbrenner & Morris, 2006), variability among homes with respect to the home-literacy environment can be better understood by examining family contextual factors. Within this framework, the characteristics and experiences of both caregivers (e.g., maternal education, family income, caregiver reading difficulty) and children (e.g., age, gender, language ability) may impact the home-literacy environment directly and indirectly. Despite the growing body of research which suggest that the characteristics of both

the caregiver and the child may influence the home-literacy environment, the research on rural families has largely focused on caregivers and have ignored the impact of children characteristics. The present study addresses this gap in the literature by examining the extent to which characteristics of both the caregiver and the child may help to predict the language and literacy opportunities that low-income rural children are exposed to at home.

Socioeconomic status, as indexed by maternal education and family income, has consistently been evidenced to be a strong predictor of the home-literacy environment. Children of families with lower educational attainment and household income generally have less opportunities than their affluent peers to access a wide variety of literacy experiences and resources (Brooks-Gunn & Duncan, 1997; Scarborough & Dobrich, 1994). However, there is still variation in the type and frequency of literacy activities within groups of families of similar socioeconomic standing (Marcella, Howes, & Fuligni, 2014; Phillips & Lonigan, 2009; Rodriguez et al., 2009). In their study of low-income rural Appalachian families, for instance, Curenton and colleagues (2008) found that mothers with higher maternal education had more positive parental reading beliefs than less educated mothers, although there were no differences in the frequency of shared storybook reading between both groups. Tichnor-Wagner et al. (2016) found that even among low-income rural families, there was still variability in these children's access to and exposure of literacy-related resources and activities.

Studies of more nuanced aspects of family risk factors such as reading history may further clarify the role that rural caregivers' educational experiences have on the home-literacy environment. Trajectories of caregivers with history of reading problems suggest that they have an increased likelihood of having children who exhibit reading difficulties compared to caregivers who did not report such problems (Bergen, Jong, Maassen, & Leij, 2014; Costa et al., 2013; Tambyraja, Schmitt, Farquharson, & Justice, 2017). Children from these homes are often less exposed to enriched literacy-oriented opportunities (Dilnot, Hamilton, Maughan, & Snowling, 2017; Roberts, Jergens, & Burchinal, 2005) and are thus at risk of experiencing reading problems themselves. Studies that examine familial risk of reading difficulty tend to find that rates of reading problems are exacerbated among caregivers from low-income backgrounds (Łockiewicz & Matuszkiewicz, 2016; Smart et al., 2017). For example, Garrett-Peters and Mills-Koonce (2013) found that even within a predominately low-income rural sample, income was still associated with reading difficulty. Mothers in the lowest income group performed the most poorly on an achievement test of reading comprehension. To date, though, no study of which we are aware has examined whether rural caregivers' history of reading difficulty influences the home-literacy environment.

Alongside the characteristics of caregivers, various child-related characteristics may also influence the literacy experiences provided within rural homes. For instance, children's age appears to influence the home-literacy environment: as children get older, the frequency with which they engage in shared storybook reading as well as the amount of materials and type of activities made available also increase (Burgess, 2011). The literacy experiences offered within the home are also associated with the gender of the child. Boys have generally been found to engage less frequently in literacy-based activities and interactions than girls. These differences may be attributed to findings that girls tend to demonstrate more positive attitudes towards readings than boys (McGeown et al., 2015; Ozturk, Hill, & Yates, 2016). This finding may also be associated with gender roles since girls are typically socialized to engage in quiet and calm activities and boys are more often encouraged to be involved in active play (Lytton & Romney, 1991).

Numerous studies have also provided evidence to suggest that the language ability of children is related to the home-literacy environment. These studies have generally found that the home-literacy environment differs for children with and without language difficulties (Sawyer et al., 2014; Skibbe, Justice, Zucker, & McGinty, 2008). These studies typically demonstrate that children with language impairments are less likely to be exposed to enriched home-literacy environments than children with typically developing language skills (Marvin, 1994; McGinty & Justice, 2009; Tambyraja et al., 2017). Identifying the relation between children's language ability and the home-literacy environment may be particularly important given that deficits in rural children's language and literacy skills begin before formal schooling and continue to be below normative means in later years (Justice, Jiang, Khan, & Dynia, 2017; Reynolds & Fish, 2010; Smith, Myers-Jennings, & Coleman, 2000).

To summarize, the present study was designed to advance understanding of the home-literacy environment of rural families. We do so by assessing the dimensionality and interrelations among active dimensions of this construct and by investigating both the child- and caregiver-level characteristics associated with low-income rural children's engagement in the home-literacy environment. We build on previous research of rural families by considering the extent to which the home-literacy environment is interrelated with several key family characteristics. Although various factors are likely related to rural families' home-literacy environment, this study specifically examined caregiver maternal education and income, and children's age, gender, and language ability. The research aims were twofold. The first aim was to determine whether rural families engage in the four dimensions of the home-literacy environment and the extent to which these dimensions are interrelated. The second was to examine whether specific caregiver- and child-level characteristics predict the four home-literacy environment dimensions.

Methods

Sample

Families in this study had children participating in rural preschool programs enrolled in an experimental study examining the effects of an early-literacy curriculum. Recruitment efforts for the experimental study targeted (a) preschool classrooms in which children met age requirements for kindergarten entry in the forthcoming academic year and (b) center-based programs that prioritized enrollment of families residing in low-income rural counties across West Virginia, Virginia, and Ohio. The 466 families and children included in the analytical sample of the present study were a subset of a larger number of consented children (n = 506), representing those families for whom a questionnaire focused on the home-literacy environment was completed at study entry. Information about the home-literacy environment was collected initially as a vehicle for examining moderators of curriculum effects, but is more thoroughly examined in the present study given its potential for enhancing our understanding of children in low-income rural homes. There were no differences between included and excluded families on relevant background variables including children's language abilities and children's demographic characteristics such as gender and age (all p values $>$ .05).

Children included in the present study ranged in age from 46 to 62 months in the fall of preschool year, with a mean age of 53 months. Approximately 53% of our sample were girls. Of the participating children, 89% were identified as Caucasian, 7% as African-American, and the other 4% as other races or multiracial. Fifty-one percent of enrolled children lived in households with an annual income of less than $20,000; of the remainder, 23% of children lived in households with an annual income between $20,001 and $35,000, and 26% of children lived in households with an annual income above $35,000. The highest income category reported was 85,001 or more, which took up 3% of the sample. In terms of highest level of education completed by children's mothers, 10% of mothers did not complete high school, 46% had only a high school diploma, 25% had some college education but no degree, 9% obtained an associate degree, and 10% reported having at least a bachelor's degree.

Procedure

Procedures of relevance to this study included a measure of the home-literacy environment from children's caregivers in the fall of the academic year and assessment of children's language skills within the same time frame. Given that the data were collected in the beginning of the school year and prior to any experimental effects from the larger study to have occurred, no distinction was made for children across research conditions.

Measures

Home-literacy environment questionnaire. Caregivers completed a comprehensive 23-item self-report questionnaire regarding the home-literacy environment derived from various instruments described in the literature (DeBaryshe & Binder, 1994; Petrill, Deater-Deckard, Schatschneider, & Davis, 2005). The questionnaire required caregivers to provide responses to questions concerning their shared storybook reading, access to and use of books and other literacy-related materials, as well as their attitudes and beliefs about reading with their child. A subset of items was identified for the purposes of this study, measuring four theoretically-derived dimensions of the home-literacy environment. Description of the these home-literacy environment dimension follows.

Parent-child interactions captured the volume of reading activities children are exposed to in the home (3 items; e.g., "How often do you and your child read books together?"); *child literacy interest* captured the frequency with which children engaged in independent reading activities and initiated reading interactions as well as how much the child enjoyed being read to (5 items; e.g., "How often does your child ask you to read books to him/her?"); *library use* reflected the extent to which children visit the library and check out books (2 items; e.g., "How often do you go to the library with your child?") and; *access to books* represented children's first exposure to reading and the amount of books made available within the home (2 items; e.g., "How old was your child when an adult first read books to him or her?"). Table 1 presents a list of the items used for the study and the response categories for each item.

Items from three of the dimensions (*parent-child interactions*, *child interest*, and *library use*) are generally answered on a 4-point scale. An exception is one item from the *library use* dimension which was originally an open-ended question ("About how many books does your child bring home from the library?") but later dichotomized to better reflect the highly-skewed responses. Both items from the *access to books* dimension were open-ended questions.

Family and child demographic information. In addition to providing information about the home-literacy environment, caregivers provided basic information about household characteristics, including a summary of persons living within the household. This included information regarding children's age and gender as well as educational attainment, income and any known reading difficulties in either grade school or high school for the primary caregiver. Maternal education was originally assessed on a 9-point scale (0 = eighth grade or below and 8 = doctorate degree). For the purpose of the present study, we categorized maternal education into five categories: no high school diploma, high school diploma, some college but no degree, associate degree and bachelor's degree or above. To assess history of reading difficulty, caregivers reported the extent to which they experienced difficulty with reading in grade school and in high school. The response options ranged fro*m (0) no problems* to (5) *did very poorly*. The data reflected highly skewed responses, with 327 respondents indicating No Problem in grade school and the remainder (139) noting that they had some or significant problems. Furthermore, only 82 respondents reported a history of reading difficulty in high school whereas 382 reported no history. Therefore, history of reading difficulty was recoded into a dichotomous variable, with 0 indicating no problem and 1 reflecting any indication of reading difficulty. The percentage of caregivers who had experienced any reading difficulty, either in grade school or in high school, was 33%.

Child language skills. Children's language abilities at the start of the study were measured using the *Clinical Evaluation of Language Fundamentals Preschool-Second Edition* (CELF-P2; Wiig, Secord, & Semel, 2004). The Core Language subtests (Sentence Structure, Word Structure, and Expressive Vocabulary) of CELF-P2 were administered in one-on-one sessions by trained research assistants. The Sentence Structure subtests assesses a child's ability to interpret spoken sentences of increasing length and complexity. The Word Structure subtest evaluates a child's ability to apply inflected morphology and use pronouns. The child is required to listen to a model sentence and is then asked to complete a test sentence of the same structure using the appropriate inflected morphology. The Expressive Vocabulary requires a child to provide a single word label for the person, object, or action illustrated in each picture stimulus and is used to evaluate children's referential naming ability for people, objects, and actions. For each subtest, raw scores can be used to derive standard scores based on a mean of 10 and standard deviation of 3. On average, the sampled children in the

Table 1
Descriptives of items from Caregiver Literacy Survey (CLS).

Domains and items	Summary			
Parent-child interaction				
1. How often do you and your child read books together?	1 Never: 0.4%	2 Sometimes: 20.3%	3 A lot: 45.8%	4 All the time: 33.5%
2. How often do you or another family member sing or recite rhymes to your child?	1 Never: 1.5%	2 Sometimes: 26.6%	3 A lot: 45.5%	4 All the time: 26.4%
3. How often do you or another family member tell stories with your child?	1 Never: 1.3%	2 Sometimes: 22.5%	3 Once a week: 36.1%	4 Daily: 40.2%
Child interest				
4. How often does your child ask you to read books to him/her?	1 Never: 1.5%	2 Sometimes: 25.0%	3 A lot: 38.8%	4 All the time: 34.7%
5. How often does your child look at or pretend to read books on his/her own?	1 Never: 0.2%	2 Sometimes: 22.0%	3 A lot: 47.4%	4 All the time: 30.4%
6. How often does your child draw pictures?	1 Never: 1.1%	2 Sometimes: 18.5%	3 A lot: 40.3%	4 All the time: 40.1%
7. How often does your child write or pretend to write letters?	1 Never: 3.2%	2 Sometimes: 23.5%	3 A lot: 38.8%	4 All the time: 34.5%
8. How much does your child enjoy being read to?	1 Not at all: 0.2%	2 A little: 7.3%	3 A lot: 28.6%	4 Loves it: 63.9%
Library use				
9. How often do you go to the library with your child?	1 Never: 33.0%	2 Sometimes: 56.0%	3 A lot: 8.2%	4 All the time: 2.8%
10. Does your child bring home any books from the library in a typical month?[a]	0 No: 50%		1 Yes: 50%	
Access to books	Mean	*SD*	Min	Max
11. How old was your child when an adult first read books to him or her? (in years)	0.780	0.695	0	4
12. About how many books does your child have at home?	62.600	60.808	4	500

[a] The item was recoded from a continuous variable (number of books child brings from the library each month) to a dichotomous variable due to the extreme skew of the variable distribution.

current study scored below the normative mean in all subtests (Sentence Structure: mean = 8.9, *SD* = 2.4, range = 2–16; Expressive Vocabulary: mean = 9.5, *SD* = 2.6, range = 2–17; Word Structure: mean = 8.9, SD = 2.4, range = 1–17), although only a limited percentage of the sample displayed potential delay in language development based on the guidelines of CELF-P2. Specifically, 13% of the sampled children scored below average (6 or below) in Sentence Structure, 12% in Expressive Vocabulary, and 17% in Word Structure. The scaled scores of the three subtests were standardized and combined to obtain an overall score for CELF representing children's core language skills.

Analytic strategy

As prerequisite for our analyses, we first tested the factor structure of home-literacy environment via confirmatory factor analyses (CFA). While standard CFA is based on a Pearson correlation that assumes continuous, normal distributions of variables, the home-literacy environment scale requires an alternative model because it contains a mixture of continuous and categorical (dichotomous and ordinal) items. Therefore, we employed weighted least square (WLS) estimation, which does not require normal variables and can fit the continuous and categorical variables as appropriate (via either the linear or probit model). Since our study is focused on the literacy environment children directly interact with, we excluded from the original questionnaire eight items measuring parental literacy beliefs and parental reading habit. Three items were further dropped (concerning how many hours a day children watched television, whether or not the child receives a magazine in the mail, and whether or not there is access to specific literacy materials) because they significantly reduced the fit of the model. The remaining 12 items reflected the relevant dimensions of this study theorized to reflect active dimensions of the home-literacy environment: (a) *parent-child interaction* (three items), (b) *child interest* (five items), (c) *library use* (two items), and (d) *access to books* (two items). Table 2 summarizes the results of the CFA.

For our first research question, we examined descriptive statistics of all 12 home-literacy environment items. Specifically, frequency analyses were conducted on categorical variables and descriptives (mean, standard deviation or *SD*, and range) were obtained for continuous variables. These analyses provided descriptions of rural families' engagement in different aspects of home literacy activities. We then conducted a correlation analysis to evaluate the interrelations among the four dimensions.

The final research question of this study was to identify child and caregiver characteristics that were associated with rural families' home literacy activities. Once the construct validity of home-literacy environment was established, we examined six child and caregiver characteristics as potential predictors of the four dimensions of home-literacy environment using Multiple Indicators Multiple Causes (MIMIC) model (Muthén, 1988). The MIMIC model has the advantage of allowing the simultaneous estimation of the measurement model as well as of the association between covariates (i.e., characteristics) and latent variables. All analyses were conducted using Mplus 7.11 (Muthén & Muthén, 1998–2012) using the robust weighted least square estimator (Muthén, 1984).

Missing data treatment. With the exception of one item (how old was the child when he/she was first read to), which had 36% nonresponse, all other variables had reasonably low percentages of missing data (0% to 12%). Instead of listwise deleting missing data, which has been shown to produce biased results and low power (Graham, 2012), full information maximum likelihood (FIML) was used to treat missing data in all analyses (Arbuckle, Marcoulides, & Schumacker, 1996). As an extension of the maximum likelihood method, the effectiveness of FIML is based on the adequacy of the hypothesized data model and the hypothesized missingness model. Therefore, when our hypothesized CFA and MIMIC models are adequate, and the missing-at-random (MAR) assumption is plausible, the estimates derived from FIML should be unbiased (Little, Jorgensen, Lang, & Moore, 2014). While there is no conclusive way to prove that the data are MAR instead of missing not at random (MNAR), given the lack of correlation between missingness and key variables in the dataset, it is reasonable to make the assumption of MAR since there is a lack of ground to believe otherwise (Schafer & Graham, 2002). Moreover, in most applied research, MAR-based techniques such as FIML are robust to mild deviation from MAR (Collins, Schafer, & Kam, 2001).

Table 2
Results of confirmatory factor analyses (CFA): Testing a four-factor structure of HLE.

Factor and items	λ	S.E.	R^2
Parent-child interaction			
1. How often do you and your child read books together?	0.760	0.042	0.577
2. How often do you or another family member sing or recite rhymes?	0.499	0.048	0.249
3. How often do you or another family member tell stories with your child?	0.568	0.049	0.323
Child interest			
4. How often does your child ask you to read books to him/her?	0.827	0.031	0.683
5. How often does your child look at or pretend to read books on his/her own?	0.730	0.037	0.532
6. How often does your child draw pictures?	0.386	0.048	0.149
7. How often does your child write or pretend to write letters?	0.500	0.045	0.250
8. How much does your child enjoy being read to?	0.751	0.037	0.564
Library use			
9. How often do you go to the library with your child?	0.889	0.102	0.790
10. Does your child bring any books from the library in a typical month?*	0.906	0.100	0.822
Access to books			
11. How old was your child when an adult first read books to him or her?	0.514	0.083	0.264
12. About how many books does your child have at home?	0.665	0.104	0.443

Note. λ: Standardized factor loading; S.E.: Standard error of estimates; R^2: percentage of item variation accounted for by the factor.
All coefficients are significant at 0.001 level (i.e., $p < 0.001$).
* The item was recoded from a continuous variable (number of books child brings from the library each month) to a dichotomous variable due to the extreme skew of the variable distribution.

Results

Description of rural home-literacy environment

To examine the extent to which rural families engage in different aspects of the home-literacy environment, we summarized the responses to the 12 items in Table 1. The items are organized by the four dimensions of the home-literacy environment. For items with yes/no options or rating scales, percentages of responses fallen into each category are listed; otherwise the mean, *SD*, and the range of responses are presented. For the full results of rural families' activities across the dimensions of the home-literacy environment see Table 1. Most notable is our findings related to the dimensions of parent-child interactions, library use, and access to books. In terms of parent-child interactions, one-third of caregivers read to their children all the time, while the majority of the caregivers read a lot (46%), or sometimes (20%). In terms of storytelling, 40% of caregivers did so daily, and 36.1% did so at least once a week. Low level of library use was observed: 33% of the caregivers never went to library with their children, 56% sometimes went, and only 11% went to library regularly (“A lot” or “All the time”). Only half of the children would bring home any books from the library in a typical month. Finally, large variation was observed in children's

access to books. The number of children's books owned at home ranged from 4 to 500; also, whereas on average caregivers started to read to their children at 9 months of age, some children were first read to as late as 4 years old. The variability in caregiver report of these dimensions of the home-literacy environment suggest the importance of exploring caregiver- and child-level factors that may be associated with this variability.

Confirmatory factor analysis

In order to examine the home-literacy environment dimensions, a four-factor model was fitted to the data as a starting point. Based on our a priori hypotheses we tested a simple factor structure with no cross loading allowed. While the initial CFA had unsatisfactory fit (Chi-squared = 564.454, $df = 48$, $p < .001$; RMSEA = 0.152, 90% CI of RMSEA = [0.141, 0.163]; CFI = 0.863; TLI = 0.812; WRMR = 2.185), some modifications were suggested to further improve model fit. After examining the suggested modifications and the relationship between items, we added four error covariances, between items 6 and 7 (both involve children's paper-based literacy activities), items 3 and 4 (both involve "you or another family member"), items 1 and 4 as well as items 1 and 8 (all involve shared storybook reading). With the additional covariance captured, the factor model had a good fit (Chi-squared = 145.535, $df = 44$, $p < .001$; RMSEA = 0.070, 90% CI of RMSEA = [0.058, 0.083]; CFI = 0.973; TLI = 0.960; WRMR = 1.044).

Results of the final CFA model are presented in Table 2 (item loadings) and Table 3 (correlation between factors). As shown in the tables, standardized factor loadings range from 0.386 to 0.906. With regard to correlation between the different aspects of home literacy environment, while library use had generally low correlation with the other factors (0.24–0.28), the other factors are well correlated ($r = 0.46$–0.80). For example, parent-child interaction and child interest are highly correlated (0.80), indicating that high frequency of parent-child literacy interaction is typically accompanied by high level of child-initiated literacy activities. Access to books also demonstrated a moderate association with parent-child interaction (0.69) as well as with child interest (0.46).

Multiple indicators multiple causes model

MIMIC model was used to assess the relations between home literacy dimensions and child/caregiver characteristics (child age, gender, baseline language score, caregiver reading difficulty, maternal education, and family income). While five categories of maternal education were included in the original model, only one category – mother having college education (with or without a degree) – turned out to be associated with any of the factors. Therefore, for the purpose of parsimony we retained only one category of maternal education in the final model. The model was a good approximation to the data, as indicated by adequate model fit indices (Chi-squared = 259.719, $df = 92$, $p < .001$; RMSEA = 0.063, 90% CI of RMSEA = [0.054, 0.072]; CFI = 0.958; TLI = 0.930; WRMR = 1.021). The variance accounted for in the four home-literacy environment dimensions ranged from 5.3% (parent-child interaction) to 18.5% (child interest). Table 4 shows the path coefficients for the predictors on the four factors in the MIMIC model, and Fig. 1 depicts the model diagram with only the significant paths displayed.

Table 3
Correlations between four factors of home literacy environment.

	1	2	3	4
1. Parent-child interaction	–			
2. Child interest	0.804***	–		
3. Library use	0.281***	0.253***	–	
4. Access to books	0.688***	0.459***	0.243**	–

*** $p < .001$.
** $p < .01$.

As shown in the table, parent-child interaction was predicted by caregiver(s) having reading difficulties in school (b = −0.18, $p = .003$). In other words, children whose caregiver(s) had difficulty reading in school tended to have fewer literacy-based interactions with their parents. Child interest was predicted by child language skills (b = 0.12, $p = .034$), child gender (b = 0.39, $p < .001$) and caregiver reading difficulties (b = −0.14, $p = .004$), in that girls, children with higher language skills, and children whose caregiver(s) without history of reading difficulties tended to read/write more frequently and be more interested in being read to as compared to their peers. Library use is predicted by child language skills (b = 0.14, $p = .019$) and maternal education (b = 0.15, $p = .012$), indicating that children who are more advanced in language skills and whose mothers had attended college went to the library more often. Finally, access to books is predicted by children's language skills (b = 0.25, $p = .006$), maternal education (b = 0.18, $p = .009$) and family income (b = 0.13, $p = .008$). Generally, children from families of higher SES (as indicated by more educated mothers and higher family income) tended to have earlier and more extensive access to books than their peers.

Discussion

This study extends and refines the growing research literature on low-income rural preschool children by examining four key active dimensions of the home-literacy environment and the interrelatedness among these diverse activities and resources. Moreover, this study examines both the caregiver- and child-level factors that may predict rural preschool children's literacy experience at home. Overall, our findings suggest that rural children are exposed to a wide range of dimensions of the home-literacy environment, though they may experience specific aspects more often than others. Further, the results demonstrate that although both child- and caregiver-characteristics are important in predicting the home-literacy environment, certain factors are more prominently related to the home-literacy environment than others. These findings are further discussed below.

Home-literacy environment of rural families

Related to our primary research question, our study findings suggest that there is substantial variability across the home-literacy environment of low-income rural families. Similar to research conducted in low-income urban populations (Davis et al., 2016; McLoyd, 1998; Payne et al., 1994; Wasik & Hindman, 2010), our findings suggest that there is significant variation in rural children's engagement in or access to specific aspects of the home-literacy environment such as shared storybook reading and number of books in the household. Although there was slightly less variability in the frequency with which rural families used the library, these findings mirror that which has been demonstrated in populations of diverse socioeconomic backgrounds (Phillips & Lonigan, 2009). Interestingly, our findings related to rural families' library use defies the common perception that these families may access this resource less often than other populations due to geographical barriers. These results underscore the need to consider the determining factors that may buffer the negative impact of geographic isolation on rural families' access to community agencies. Despite the well-documented economic barriers present in rural areas, for instance, a significant proportion of rural families from both poor and non-poor backgrounds are likely to own a car (Kainz, Willoughby, Vernon-Feagans, & Burchinal, 2012). Future studies may thereby benefit from examining whether certain economic assets may serve as a potential mechanism that increase rural families' accessibility and use of community agencies such as the library.

Our study further suggests that rural families' engagement in certain dimensions of the home-literacy environment is closely related to their

Table 4
MIMIC model results: Predicting home literacy dimensions with child- and caregiver-level characteristics.

Factor (% variance explained)	Covariates	β	S.E.	*p*
Parent-child interaction (5.3%)	Child language skill (CELF-4 scaled score)	0.042	0.066	0.528
	Child age in months	−0.097	0.062	0.118
	Child being a girl	0.065	0.061	0.285
	Caregiver having reading difficulty in school	−0.175	0.059	0.003
	Mother having attended college	0.016	0.067	0.806
	Family income	0.060	0.067	0.806
Child interest (18.5%)	Child language skill (CELF-4 scaled score)	0.116	0.055	0.034
	Child age in months	−0.054	0.052	0.305
	Child being a girl	0.386	0.044	< 0.001
	Caregiver having reading difficulty in school	−0.142	0.049	0.004
	Mother having attended college	0.002	0.055	0.971
	Family income	−0.007	0.052	0.901
Library use (5.4%)	Child language skill (CELF-4 scaled score)	0.137	0.058	0.019
	Child age in months	−0.036	0.060	0.551
	Child being a girl	−0.034	0.055	0.536
	Caregiver having reading difficulty in school	−0.081	0.054	0.134
	Mother having attended college	0.153	0.061	0.012
	Family income	−0.047	0.062	0.442
Access to books (14.3%)	Child language skill (CELF-4 scaled score)	0.246	0.090	0.006
	Child age in months	−0.097	0.070	0.166
	Child being a girl	−0.023	0.066	0.730
	Caregiver having reading difficulty in school	0.109	0.065	0.097
	Mother having attended college	0.175	0.067	0.009
	Family income	0.128	0.048	0.008

Note. β = standardized coefficient; S.E. = Standard error.

involvement in others. The frequency with which rural caregivers engaged their child in reading interactions appeared to be at least moderately associated with all other dimensions except for library use. Indeed, library use did not appear to be highly associated with any other dimensions of the home-literacy environment. These findings mirror that found in urban and suburban areas (Burgess, 2011; Davis et al., 2016; Yeo et al., 2014) which demonstrate relatively low associations between library visits and other aspects of the home-literacy environment. Notably, child interest was moderately associated with access to books. That is, our results indicate that rural children are more likely to independently engage in literacy-activities when resources are made available within the household. An alternative explanation may be that rural children's reading enjoyment, another aspect of child interest, elicits caregivers' willingness to make books accessible.

Relations between the home-literacy environment and child- and caregiver-level characteristics

Turning to our second research question, the present study demonstrated that characteristics of both the caregiver and child influence the degree to which rural families engage in specific aspects of the home-literacy environment. An interesting finding emerged in examining the link between the socioeconomic status of families and the home-literacy environment of rural households. Both maternal education and family income were only significantly associated with the resources made available to children but were not a significant predictor of parent-child interactions and child interest. That is, our study found that rural children from higher socioeconomic statuses are no more likely to engage in literacy-based activities and interactions than children from less advantaged statuses. Given that rural families from both poor and non-poor backgrounds often work long and non-standard hours (Rivers, 2005) these findings may reflect, in part, the reduced available and predictable time these families may have to engage their children in stimulating literacy-based interactions at home. Future studies may benefit from exploring the relationship between families' work characteristics and the home-literacy environment in rural communities.

According to our results, another important characteristic of caregivers that may help to explain the variation in the home-literacy environment is their history of reading difficulty. Children of caregivers who reported previous reading problems had less opportunities to engage in parent-child interactions and demonstrated less reading interest than those whose caregivers did not report such problems. History of reading problems did not, however, predict the extent to which rural

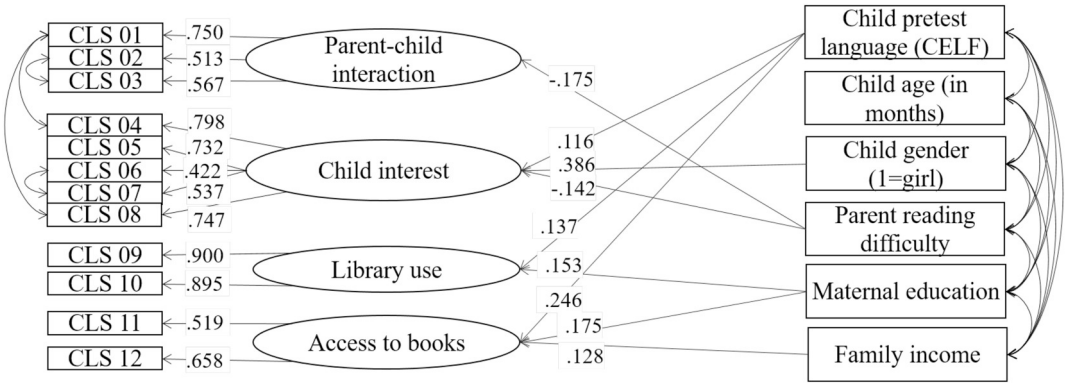

Fig. 1. MIMIC model results: predicting factors of HLE with child and caregiver characteristics, only the significant paths displayed.
Note. Correlations between factors are included in the model but not drawn in the diagram.

families accessed the library or made books available within the home. One possible explanation for these findings is that access to these resources does not necessarily involve the active use of specific literacy skills. Said differently, the ability of families to access literacy materials and resources is not necessarily dependent on the reading experiences of the caregiver. Results from the present study help to disentangle the effects of the educational attainment and history of families by demonstrating that rural families' educational level and history are associated with very specific dimensions of the home-literacy environment. The findings from the current study highlight the need for examining more nuanced facets of rural families' educational background to better develop more targeted interventions for rural children at risk for later reading difficulties.

Lastly, our final major finding is that there is a differential exposure of the home-literacy environment between rural children with poor and strong language skills. Similar to studies conducted of children with and without language impairments (Skibbe et al., 2008; Tambyraja et al., 2017), our study found that rural children with more advanced language skills have more opportunities to engage in and be exposed to diverse aspects of the home-literacy environment than their less skilled peers. That is, rural children who already start out with advantages in terms of their language abilities, are provided with enriched language and literacy environments which help them to increase their growth of literacy-related skills, while their less advanced peers are not often given such opportunities and may thereby fall progressively further behind. Given that rural children often enter school with significant delays in their language skills (De Marco & Vernon-Feagans, 2013; Fish & Pinkerman, 2003; Stockard, 2011), this study highlights the need for programs that target rural children with poorer language skills. This effort may help to narrow the educational gap between rural children with and without advanced language skills.

Limitations

Despite the contributions of the present study, several limitations warrant note. First, the present study made use of self-report questionnaires which can be subject to bias. Future studies should employ observational data in examining the home literacy experiences of rural families. In addition to providing a potentially unbiased estimate of the frequency with which these activities occur within the home, an observational method may also allow for examination of the *quality* of interactions between caregivers and children. Examining parental language strategies such as language modeling and communicative style/responsiveness may be particularly important given that large variability has been found even within rural families from low-income environments (Abraham, Crais, & Vernon-Feagans, 2013). Thus, understanding the nature of these interactions can provide an even more nuanced characterization of the home-literacy environment of rural families and further support efforts aimed at improving the developmental outcomes of rural children. A second limitation of this study is the response scale anchors of the home-literacy environment items on the questionnaire. For many of the items, the rating scale did not allow families to specify the frequency with which they engaged in or provided literacy-related activities and resources. The response scale for how often the caregiver and child read books together, for instance, ranged from 'Never' to 'All the time.' It would be of benefit to employ more precise scaling options that better capture the frequency with which rural families engage in the home-literacy environment in future studies.

A third limitation is that only some of the contextual factors that are potentially related to rural families' home-literacy environment could be examined. Although an important first step, the factors analyzed in the present study only accounted for a relatively small proportion of variance in rural families' home-literacy environment. There are other diverse factors that are also likely to be related to the literacy resources and activities made available within rural households. It is possible, for example, that neighborhood characteristics may be predictive of the literacy-based activities and resources provided within rural homes. Rural areas are often characterized by a high sense of community cohesion and connectedness among neighbors (Beggs, Hurlbert, & Haines, 1996; Denby & Bowmer, 2013; Vernon-Feagans, 2013). These social ties may then provide emotional, financial, and physical support that may help to reduce the burdens associated with poverty. These social ties may also allow rural families from lower socio-economic backgrounds to have contact with middle and higher-income families, thereby increasing the cultural capital available to these families and the opportunity to engage in or have modeled diverse literacy practices. Future research of the home-literacy environment of low-income rural families should explore the neighborhood context as a potential mechanism that may enhance the home-literacy environment of rural families in the face of economic adversity.

A fourth limitation is the demographic of families in the current study which may limit generalizability to other rural families. More specifically, families from the present study were recruited from three mid-western rural states. The rural region, however, may differ significantly by state with respect to racial composition, special education placement, and instructional expenditure (Strange, Johnson, Showalter, & Klein, 2012), which have important implications on the provision of literacy activities that may be provided within the home. Furthermore, rural communities may differ with respect to their rurality as measured by the distance away from urban areas. Residents of fringe rural areas live on the outskirt of large metro areas and may thereby be better able to access the resources made available in developed areas in comparison to residents of remote rural areas. Future studies may benefit from examining the home-literacy environment of a more nationally representative sample of rural families and communities. A final limitation to this study is that all the children were enrolled in preschool and are likely to differ in their home-literacy environment than those enrolled in home-based care arrangements.

Summary

Findings from the present study indicate that there is substantial variability in the opportunities that low-income rural children have in engaging in the home-literacy environment. Our results further demonstrate that characteristics specific to both the caregiver and child explain unique variations in the language and literacy practices of rural families. Ultimately, this study may help early childhood educators and policymakers to better capitalize on the experiences already offered within rural homes and differentiate programming for rural children most at risk for poor reading outcomes. The present study is an important first step in this direction.

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