ASHA American Speech-Language-Hearing Association

AJSLP

Research Article

Assessing Shared Reading in Families at Risk: Does Quantity Predict Quality?

Maura O'Fallon,[a] Rebecca M. Alper,[a] Molly Beiting,[b] and Rufan Luo[c]

[a] Department of Communication Sciences and Disorders, Temple University, Philadelphia, PA [b] Department of Communication Sciences and Disorders, Syracuse University, NY [c] School of Social and Behavioral Sciences, Arizona State University – West Campus, Phoenix

ARTICLE INFO

Article History:
Received January 17, 2022
Revision received April 10, 2022
Accepted June 1, 2022

Editor-in-Chief: Erinn H. Finke
Editor: Amy L. Donaldson

https://doi.org/10.1044/2022_AJSLP-22-00013

ABSTRACT

Purpose: Quantity and quality of early at-home reading shape literacy outcomes. At-home reading frequency is a common outcome measure in interventions. This single measure may not fully capture the quality of early reading interactions, such as parent and child references to print, an important contributor to language and literacy outcomes. This study aims to evaluate if and how reported reading frequency and duration are associated with parent and child print referencing, controlling for perceived parenting self-efficacy, developmental knowledge, and child sex.
Method: This study is a secondary analysis of baseline data from a treatment study with parents (N = 30) and children (1;1–2;3 [years;months]) from under-resourced households. Parents reported weekly reading episode frequency and duration (in minutes). We coded parent–child book-sharing interactions to quantify use of print references.
Results: Negative binomial regression modeling suggested that parents who reported more weekly reading episodes tended to use more print references during interactions. However, reported reading time in minutes was not significantly associated with parents' print referencing. Parents' print references were also associated with perceived self-efficacy, developmental knowledge, and child sex. In our sample, parents used more print references with male children. Neither reading frequency nor reading time was associated with increased print referencing from children.
Conclusions: Duration of reading did not positively predict children's use of print references. However, weekly reading frequency positively predicted parents' use of print references. Parent perceived self-efficacy and knowledge may predict early interaction quality similarly to quantity of reading.
Supplemental Material: https://doi.org/10.23641/asha.20669094

Approximately 65% of fourth-grade students in the United States read at or below basic grade-level expectations. Lower-performing readers make minimal progress compared to their higher-performing peers (National Center for Education Statistics, 2019). Differences in early reading ability, coupled with contrasting rates of progress, lead to widening developmental disparities (Duff et al., 2015; Stanovich, 1986). Early reading weaknesses have long-term impacts, including poor oral language, literacy, and academic outcomes (Mol & Bus, 2011). Before school entry, foundational literacy skills are shaped by children's home environments and parent perceptions (Bingham, 2007; DeBaryshe, 1995) as well as high-quality reading interactions (Justice & Ezell, 2000, 2002; Zevenbergen & Whitehurst, 2003).

Several nationwide programs promote early at-home reading, particularly within populations at risk for language or reading disorders. Many programs provide parents with books and suggestions for creating high-quality reading interactions at home (Dolly Parton's Imagination Library, 2021; Reading Is Fundamental, n.d.; Reach Out and Read, n.d.). Despite a focus on interaction quality in training, interventions often use parent-reported quantity

Correspondence to Maura O'Fallon: maura.ofallon@temple.edu. ***Disclosure:*** *The authors have declared that no competing financial or nonfinancial interests existed at the time of publication.*

of reading time to measure success. Although reported frequency may be an efficient outcome measure for large-scale data collection, its utility as an indicator of intervention success may be limited by the extent to which it reflects the quality of early reading interactions. Although reading frequency is correlated with parents' use of enriching strategies (Anderson et al., 2019a, 2019b; Sawyer et al., 2014), these analyses have not accounted for the influence of parent- and child-level traits, which are influential components of the home literacy environment (Hume et al., 2016; Lin et al., 2015). This study represents a contribution to the broader question of the relationship between quantitative measurements and early interaction quality. Specifically, we use reported reading time and observed print references from parents and children to examine the relationship between interaction quantity and quality in the context of the home literacy environment. We use the term "parent" inclusively of the diversity of primary caregivers across family structures.

Bioecological Model and Literacy Development

In this study, we examine literacy development within a bioecological theoretical framework (Bronfenbrenner & Morris, 2007). This model posits multidirectional influences on development between people and their environmental context. Across the lifespan, individuals engage in reciprocal, dynamic interactions with their environments, which shapes development (Adamson et al., 2020). Applying the bioecological model to early literacy interactions, child and parent reading behaviors and preferences reciprocally shape shared reading (Grolig, 2020).

Evidence on reading interactions (Preece & Levy, 2020; Wiescholek et al., 2018), as well as child language and literacy outcomes (DeBaryshe, 1995; Justice et al., 2009; Logan et al., 2020), supports the notion of reciprocal influences across development. Children's preliteracy skills are strengthened by repeated exposure to print during interactions with parents (Justice & Ezell, 2000). Similarly, parents' motivation to engage in shared reading increases as children express interest in literacy (Preece & Levy, 2020). This bidirectional influence provides a framework for understanding how various forces shape early literacy development. In this study, we use the bioecological model to examine parent and child shared-reading participation.

Influences on Literacy Development

Parent- and Child-Level Influences on Literacy

Parent-level influences. Parent and child perceptions, knowledge, and preferences related to reading are influential aspects of the home literacy environment (Bracken & Fischel, 2008; Burgess et al., 2002; Myrtil et al., 2019; Storch & Whitehurst, 2001). Parent perceptions of self-efficacy may be particularly important. In a population with a high socioeconomic risk, maternal self-efficacy predicts high-quality interactions during reading and free play (Alper et al., 2021). Moreover, within a low-income group of first-time mothers, those with higher scores on a measure of reading self-efficacy tended to identify fewer barriers to book sharing (Lin et al., 2015). Mothers' reading-related self-efficacy also mediates the impact of maternal education on child literacy outcomes, even after controlling for covariates (Cottone, 2012). These findings support the relationship between parent perceived self-efficacy and home literacy practices.

In addition to parental perceptions, knowledge about child development is related to early interaction quality (Alper et al., 2021; Rowe, 2018). Parents' developmental knowledge mediates the relationship between interaction quality and demographic traits such as socioeconomic status (SES) or parent education (Rowe, 2008; Rowe et al., 2016). Developmental knowledge also mediates the association between parent education and children's literacy outcomes (Rowe et al., 2016). An implementation study of a print-focused home literacy intervention found that parents with lower awareness of book-sharing benefits were less likely to initiate and complete required reading interactions with their child (Justice et al., 2015). Broadly, greater understanding of the importance of reading and literacy appears to support parents' use of high-quality strategies. The connections between early interaction quality and parent knowledge of child development suggest that this factor should be considered when evaluating early book sharing.

Child-level influences. Children's reading preferences and attitudes also influence language and literacy development. Child reading interest in preschool predicts early literacy skills and may mediate the relationship between inattention and early reading ability (Hume et al., 2016). Although reading interest may differ by sex, the evidence is inconsistent and seems to vary by outcome measure. When parent-reported interest in literacy is compared across sexes, preschool-age girls are rated as more interested than boys (Baroody & Diamond, 2013; Baroody & Dobbs-Oates, 2011). However, when child-reported interest or observed engagement with reading is used, there are no significant sex differences (Deasley et al., 2018; Ozturk et al., 2016). These early interests and attitudes from children, which may vary by sex, appear to be influential in shaping their reading behaviors. Parents may also modify shared-reading behaviors depending on child sex, if they perceive boys to be less interested in reading than girls.

Quantity and Quality of Early Reading

The amount of time children spend reading with parents is important for language and literacy outcomes

(Logan et al., 2020; Mol & Bus, 2011) and may mediate the relationship between motivation and literacy outcomes (Becker et al., 2010). Frequency may also be connected to literacy interest. Children with greater early interest in literacy tend to participate in more frequent reading interactions compared to less-interested peers (Scarborough & Dobrich, 1994). Early differences in reading interest and frequency may increase over time; gaps between weak and strong readers widen throughout development (Stanovich, 1986). Shared-reading frequency is positively associated with child outcomes across SES groups (Bus et al., 1995) and within a low-income population (Raikes et al., 2006). Children who frequently engage in early, enriching book-sharing interactions tend to enjoy and initiate future reading episodes (Morrow et al., 1990; Pillinger & Wood, 2014). Thus, quantity of reading should be considered in the evaluation of children's early literacy behaviors and development.

High-quality shared-reading interactions also support children's literacy development (Justice & Sofka, 2010; Mol & Neuman, 2014). In this article, we use "high-quality" to refer to features or styles of shared reading that promote positive child outcomes. Although parents may facilitate high-quality reading interactions in many ways, such as using complex language (Crain-Thoreson et al., 2001) or following a child's interests and asking open-ended questions (Zevenbergen & Whitehurst, 2003), in this study, we focus on a single marker of quality: print referencing. Print referencing refers to behavior that emphasizes a book's textual elements and organization (Justice et al., 2009). These strategies may highlight book organization, letters, words, or the function of print (Justice & Sofka, 2010). During shared reading, children's use of print references demonstrates their engagement with the interaction as well as emergent literacy skills and receptiveness to print contact (Justice et al., 2008). Parents' use of print referencing during early shared reading is positively associated with children's literacy and attention to print (Evans et al., 2008; Justice & Ezell, 2000; Justice et al., 2008). Although beneficial to early literacy, parents do not use these strategies frequently in the absence of an intervention (Ezell & Justice, 1998; G. Phillips & McNaughton, 1990). Parents' use of print references while reading may be related to their developmental knowledge of early literacy (Justice et al., 2011, 2015).

Interventions Targeting Early Literacy

Within a bioecological framework, altering a child's environment can shape development. Early reading frequency (Bus et al., 1995; Logan et al., 2020) and quality (Justice & Ezell, 2000, 2002; Zevenbergen & Whitehurst, 2003) are two aspects of the home literacy environment that are positively associated with preliteracy. Many early literacy intervention programs, which are often intended for children with a high socioeconomic risk (Lonigan et al., 1999), include environmental supports such as reading resources and parent instruction (High et al., 2000; Needlman et al., 2005). Although parent education varies across interventions, most emphasize use of high-quality reading strategies. Although these interventions likely aim to increase the quantity and quality of book sharing, many rely on reported reading frequency to gauge intervention success (High et al., 2000; Nagamine et al., 2001; Needlman et al., 2005). However, there has been limited exploration of the association between reported reading frequency and print referencing during early interactions. This gap in the evidence has clinical implications, particularly among young children at risk for persistent language and/or literacy disorders.

There are several reasons to believe that quantity and quality of early reading are linked. Quantity and quality of early reading interactions are positively correlated with mothers' developmental perceptions and beliefs (Bingham, 2007; DeBaryshe, 1995). Thus, it is possible that quantity and quality are associated via positive parental reading perceptions. Family SES may also explain the relationship between quantity and quality, given that this third variable predicts early reading frequency (Luo et al., 2021; B. M. Phillips & Lonigan, 2009) and parent use of high-quality strategies during an intervention (Justice et al., 2020). However, early reading interaction quality also appears to vary within SES groups (Hammett et al., 2003; Malin et al., 2014). Recent findings from a large-scale book distribution program (Dolly Parton's Imagination Library, 2021) suggest that reading frequency is significantly correlated with parent use of high-quality reading strategies among families with a high risk (Anderson et al., 2019b). Although these data are promising, they do not capture the myriad influences on early reading interactions and the complexity of the early literacy environment.

Research Questions

Given that quantity and quality of reading shape early literacy, more evidence is needed on the degree to which quantitative measures reflect interaction quality. Moreover, the role of quantity and quality must be considered in the context of the broader home literacy environment, which is shaped by parents and children. The objective of this study was to examine the not-yet explored association between parent-reported reading quantity and one aspect of interaction quality, print referencing, in a population with a high socioeconomic risk. Differing from prior research, our analysis applied a bioecological model to early reading interactions by also examining parent and child influences on literacy. Findings may inform future research and help to identify more

efficient and accurate outcome measures for literacy interventions.

Our first research question aimed to examine the relationship between reading quantity and child print references. Given the link between frequent reading and early literacy skills (Bus et al., 1995; Logan et al., 2020), which include print knowledge and awareness (Hammill, 2004; Justice et al., 2008), we predicted a positive association between quantity and child print references. Our second research question examined the relationship between reading quantity and parent print references. Given the positive correlation between reading frequency and parent use of high-quality interaction strategies (Anderson et al., 2019b; Sawyer et al., 2014), we predicted that quantity of reading would positively predict parents' use of print references. Within each analysis, we also explored how child sex, parent perceived self-efficacy, and developmental knowledge may, in conjunction with reading frequency, also predict the quality of early interactions. These variables were selected based on their correlations with observed print references in our sample, as well as their impact on early interaction quality (Alper et al., 2021; Rowe, 2008) and literacy engagement (Baroody & Diamond, 2013; Baroody & Dobbs-Oates, 2011; DeBaryshe, 1995; Justice et al., 2015).

Method

Study Design and Setting

This study used a nonexperimental, observational design. We completed a secondary analysis of a subset of baseline data collected in a treatment study (Alper et al., 2021; Luo et al., 2019). The research was approved by the Temple University Institutional Review Board (#22638), and participants gave informed consent before study enrollment. The data were collected between 2016 and 2018; participants were residents of Philadelphia, Pennsylvania, or surrounding areas. Data were collected in participants' homes or in other locations in the community, at a single time point before the onset of early language intervention. Data collection sessions lasted approximately 1 hr and involved completion of a parent questionnaire and a recorded dyadic interaction in whichever order participants preferred.

Participants

We analyzed data from 30 parent–child dyads. Our sample size, which is relatively small, was limited by participation in the longitudinal study. To be eligible for participation, parents must have been monolingual English speakers or Spanish–English bilinguals at least 18 years of age, with a child at least 12 months old. Forty-six dyads were enrolled. Data from 16 dyads (n = 16) were excluded from analysis due to later-reported exposure to another language (n = 2), twins (n = 2), adult interference in parent–child interaction (n = 1), incomplete perceived self-efficacy and developmental knowledge scales (n = 1), and incomplete (n = 2) or missing (n = 8) recordings for reading interactions. Thus, data from 30 dyads were coded and analyzed.

The 30 included parents were female. The majority identified as Hispanic/Latino (n = 12, 40%) or Black/African American (n = 15, 50%). Regarding highest education level, 50% of parents reported completing high school/General Educational Development test or less, and 50% reported completing some postsecondary education. Most parents reported an annual household income of less than $25,000 ($n$ = 21, 70%). The 30 included children ranged from 13.83 to 27.24 months old (M = 19.42, SD = 3.93); there were 16 male and 14 female children. Children's reported racial/ethnic background was the same as

Table 1. Demographic information for participants included in the final analysis.

Parents' characteristic	*n*	%
Sex		
Female	30	100
Male	0	0
Ethnicity		
Black/African American	12	40
Hispanic/Latino	15	50
White/Caucasian (not of Hispanic origin)	1	3.33
White (of Hispanic origin)	1	3.33
American Indian, Black, Hispanic, and White	1	3.33
Highest level of education		
High school/GED or less	15	50
Postsecondary education	15	50
Annual household income		
Less than $25,000	21	70
$25,000–$50,000	7	23.33
Did not answer	2	6.67
Employment status		
Employed	4	13.33
Unemployed	26	86.67
Marital status		
Married	9	30
Single	21	70
Language spoken to child		
English or mostly English	16	53.33
Spanish–English bilingual	14	46.67
Children's characteristic	***n***	**%**
Sex		
Female	14	46.67
Male	16	53.33
Ethnicity		
Black/African American	12	40
Hispanic/Latino	15	50
White/Caucasian (not of Hispanic origin)	1	3.33
White (of Hispanic origin)	1	3.33
American Indian, Black, Hispanic, and White	1	3.33

that of their parents (see Table 1 for complete demographic information).

Measures

Print References

To measure use of print references, we analyzed videos and transcripts of shared-reading interactions. Recorded interactions were completed as part of a modified Three Boxes task and were approximately 5 min in length (Alper et al., 2021; Hirsh-Pasek et al., 2015). Parents were given two board books (Alborough, 2009; Priddy, 2008) and asked to read with their child as they typically would at home. The books selected for use in the study were 24 and 32 pages in length. For both books, there were pictures on every page and text on at least half of the pages. Each book included changes in text size and shape, and one of the books included environmental print, which provided opportunities for print referencing (Justice & Sofka, 2010). There were no instructions for which book to read first or how much time to spend on each book. Parents were not required to read both books. We analyzed approximately the middle 4 min of each interaction, which allowed for transition time into and out of the activity, as mothers' speech to children during transitions differs from that during book sharing (Tamis-LeMonda et al., 2019). Coding the middle 4 min of recorded interactions also ensured that observations were similar in length, as count data were used in analyses. For all participants, recordings were between 3:51 and 4:02 (mm:ss) in length; most (n = 26) were between 3:59 and 4:01.

We coded print referencing behaviors during interactions using Mangold INTERACT software (Mangold, 2020). We labeled the function (i.e., print reference or nonprint reference) of all verbal, nonverbal, and paired verbal–nonverbal behaviors from parents and children. Print references included any behavior related to print, words, letters, or elements of book organization (see Table 2 for coding definitions). We extracted the total number of print referencing behaviors for parents and children in each dyad. These were used as the outcome variables in regression analyses. This is consistent with previous measures of print referencing, which have been linked with improved child literacy outcomes (Justice & Ezell, 2000; Justice et al., 2009).

Reported Quantity of Reading

To measure reading quantity, we used parent responses to questions about reading frequency (i.e., How many times a week does your child read books?) and duration (i.e., For how many minutes each time?) to calculate weekly reading frequency (i.e., reading episodes) and time (i.e., minutes spent reading). Data were collected from parents by trained research assistants; no confusion

Table 2. Definitions and examples of print references.

Type	Description	Example
Verbal print references		
Interrogatives	Asking any question about print or book organization. May include open-ended, forced-choice, or yes/no questions.	- *What does this say?* - *Is this a B or a D?* - *Do we start reading at the beginning?*
Imperatives	Giving a command related to print or an element of book organization; may require verbal or nonverbal response.	- *Show me how we turn a page.* - *Show me the letter M.* - *Tell me what word this is.*
Comments	Remarking on to an aspect of the print or book organization; does not require a response.	- *There are a lot of words on this page.* - *Wow, that's a small letter.* - *We have a lot of pages left.*
Models	Demonstrating or calling attention to an aspect of print or book organization.	- *I'm going to start reading from the first page.* - *I'm turning the page to see what's next.* - Sounding out letters in a word
Labels	Providing a label or name for an aspect of print or book organization.	- *H – U – G* (labeling letters in a word) - *This is the cover of the book.* - *See the word "hug."*
Nonverbal print references		
Text tracking	Moving finger(s) along the line of text; may be accompanied by reading aloud. Finger(s) may be touching the page or hovering directly above.	- Moving finger(s) along the line of text. - Moving finger(s) along a word.
Pointing	Pointing to a print-related element of book (i.e., letter, word). Finger(s) may extend toward or touch the target of point.	- Pointing to a word, letter, or number. - Touching a word or letter along the page.
Book handling *(only coded for children)*	Appropriate handling or manipulating of a book in a way that is related to or demonstrative of book/print organization.	- Orienting book correctly. - Turning pages in the correct direction. - Opening/closing a book appropriately.

Note. Paired print references included any combination of simultaneous verbal and nonverbal behaviors (e.g., pointing while labeling, tracking while sounding out letters in a word).

or questions about the items were noted. Twenty-eight parents provided reading frequency, and 27 provided time; participants with missing data were not included in analyses. Whereas parent reports of reading may be subject to response bias or recall error (Morsbach & Prinz, 2006), parental judgments of child language tend to be accurate (Miller et al., 2017; Sachse & Suchodoletz, 2008). Reported quantity of reading is also often used as an outcome measure in early literacy interventions; thus, it is relevant to our research questions.

Demographics

We collected demographic information via parent questionnaire. Child data included age, sex, and race/ethnicity. Parent data included age, sex, race/ethnicity, language spoken to child, education, employment, annual household income, and marital status. Age was measured continuously; all other demographic variables were measured categorically. We assessed correlations of demographic data with reported reading quantity and observed parent/child print referencing. Child sex was the only demographic trait that was significantly correlated with either of these variables. Full correlation tables are included in Supplemental Material S1.

Parent Perceptions of Self-Efficacy and Developmental Knowledge

We also used parent report measures to assess parents' knowledge of child development and perceived self-efficacy, as these factors have been shown to shape early interactions (Alper et al., 2021; Lin et al., 2015; Rowe et al., 2016). We used an adaptation of the Knowledge of Infant Development Inventory (KIDI; MacPhee, 1981) to measure developmental knowledge. The adapted version of this measure includes age-appropriate items for young children and has been used in a state-level evaluation of family-centered early intervention programs for families with a high risk (Center for Prevention Research and Development, 2016). This measure assesses knowledge of motor, behavioral, language, social, and cognitive development (MacPhee, 1981).

Internal consistency calculations measure the reliability of an instrument (McNeish, 2018). The KIDI is a multidimensional measure; thus, it may yield substandard internal consistency values due to unidimensionality assumptions (Alper et al., 2021; Center for Prevention Research and Development, 2016; MacPhee, 1981; McNeish, 2018). The internal consistency of the 58-item KIDI adaptation used in this study was low (Cronbach's $\alpha = .31$, 95% confidence interval [CI] [−0.02, 0.65]). To address this, we used the psych package in R (Revelle, 2020) to remove items that negatively impacted the internal consistency of the entire measure. The majority of dropped items pertained to knowledge of physical developmental milestones and health. Our final subset had an acceptable Cronbach's α of .71 (95% CI [0.57, 0.85]) and included 33 items, which measured knowledge related to parenting, as well as cognitive, perceptual, social, and linguistic development. Parents' scores on the final subset of items were used in the analysis.

Parent perceived self-efficacy was evaluated using the "teaching" and "play" subtests from the Self Efficacy for Parenting Tasks Index–Toddler Scale (SEPTI-TS; Coleman & Karraker, 2003). The SEPTI-TS has been used to investigate parenting perceptions among parents of young children across a wide range of education and household income levels (Peacock-Chambers et al., 2017; Sevigny & Loutzenhiser, 2010). We assessed the reliability of our sample's measurement on the selected subtests and found acceptable rates of internal consistency (Cronbach's $\alpha = .85$, 95% CI [0.78, 0.92]; Revelle, 2020).

Variables

The dependent variables of interest were the total number of parent and child print references during 4 min of a single shared-reading interaction. The independent variable of interest was the reported quantity of at-home reading, measured in reading frequency and time. We constructed regression models with the two measurements, given that both have been used as outcome measures in literacy interventions (High et al., 2000; Needlman et al., 2005) or in clinical recommendations (Read Aloud 15 Minutes, n.d.). Exploratory independent variables of interest included parent perceived self-efficacy, developmental knowledge, and child sex.

Bias and Reliability

Research assistants who collected data for the treatment study were blind to this study and its hypotheses. All coders who analyzed data for this project were aware of the study hypotheses but were blind to participants' outcomes (i.e., reported reading frequency and time).

The first author independently coded all interactions. To assess reliability, six interactions (20% of 30 total participants) were randomly selected to be coded by a trained second coder. Using a document containing only time demarcations and transcribed speech, the second coder assigned codes for all behaviors and also noted segmentation errors. The second coder watched the interaction two additional times to identify and note behaviors that were not coded. Intraclass correlation coefficients (ICCs) were used to calculate coding reliability for the total number of parent and child print-referencing behaviors. We used the icc function from the irr package (Gamer et al., 2019) in R to calculate ICCs and their 95% CIs, using a two-way mixed-effects model, with single measures and absolute agreement (Koo & Li, 2016; McGraw & Wong, 1996).

The ICCs for parent and child print references were excellent (parent ICC = .96, child ICC = .99). Inspection of the CI for parents' print references suggested a possible range from poor to excellent (95% CI [0.18, 0.99]). Large CIs may be expected when calculating ICCs in a small sample (Hallgren, 2012). The CI for child print references was within the excellent range (95% CI [0.91, 0.99]. There were no disagreements in segmentation or excluded behaviors that impacted print reference counts.

Statistical Methods

Before regression modeling, we assessed the normality of parent and child print references. Results from Shapiro–Wilk tests and visual inspection of histograms indicated that data were not normally distributed (parent print references: $W = .802$, $p < .001$; child print references: $W = .831$, $p < .001$) and were positively skewed. See Figures 1 and 2 for histograms. We evaluated distributions for overdispersion by comparing variance and sample means. For parent ($M = 5.6$, $\sigma^2 = 32.593$) and child ($M = 11.967$, $\sigma^2 = 152.999$) print references, variance values exceeded sample means, which indicates overdispersion (Hilbe, 2011). Thus, we selected negative binomial regression modeling for data analysis (Hilbe, 2011; White & Bennetts, 1996).

For all predictors, we report the coefficient value, 95% CI, standard error, z score, p value, and rate ratio. Rate ratios, which show the multiplicative factor by which an outcome variable will change with a single-unit increase/decrease in the predictor variable, measure effect size (Huang & Cornell, 2012; Tripepi et al., 2007). We report Benjamini–Hochberg adjusted p values (Chen et al., 2017), for models with significant interaction effects. Missing data were deleted pairwise.

Statistical analyses were completed in R (R Core Team, 2020). To verify assumptions, we used the stats package (R Core Team, 2020). We used the glm.nb function from the MASS package to complete negative binomial regression modeling (Venables & Ripley, 2002) and the p.adjust function from the stats package (R Core Team, 2020) to calculate adjusted p values. For data visualization and plots, we used ggplot2 (Wickham, 2016) and sjplot (Lüdecke, 2021).

Figure 1. Distribution of child print references.

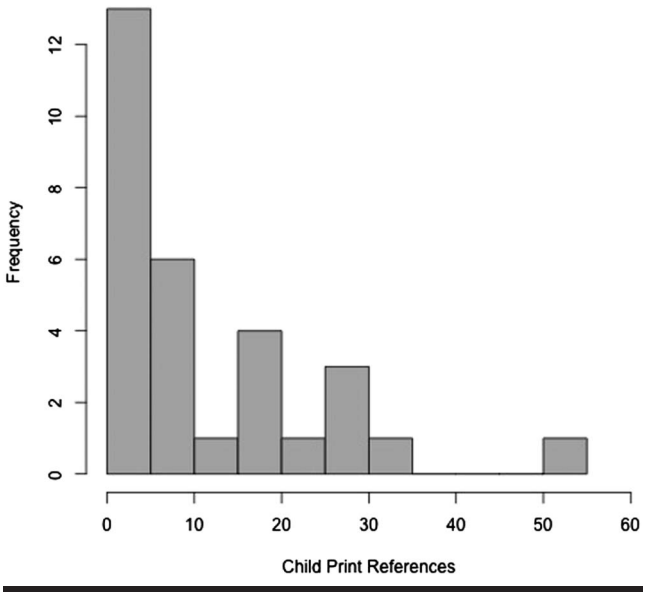
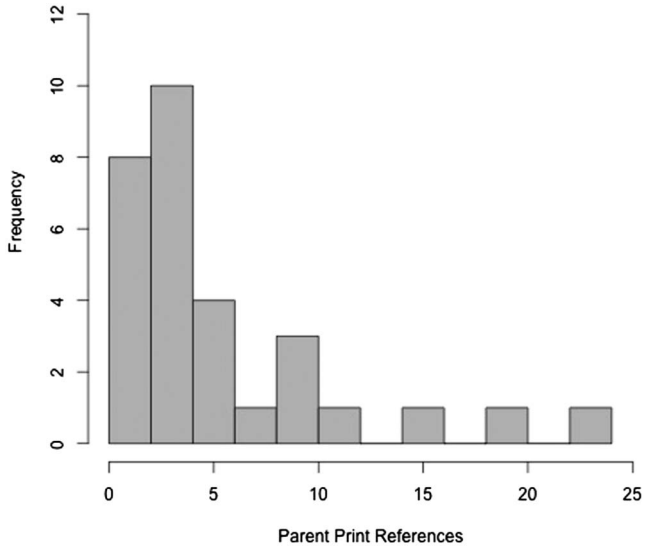


Figure 2. Distribution of parent print references.



Results

To evaluate the relationship between quantity of reported at-home reading time and observed print references during 4-min, naturalistic reading interactions, we used negative binomial regression modeling. In this study, we were interested in the relationship between parent-reported reading quantity and observed interaction quality. Two commonly used quantitative measures of at-home literacy are reading time and frequency (Reach Out and Read, n.d.; Read Aloud 15 Minutes, n.d.). Thus, we created models to evaluate the predictive utility of reading time (i.e., weekly minutes of reading) and frequency (i.e., weekly reading episodes). Exploratory independent variables that reflected influential aspects of the home literacy environment were included in models based on correlations in our data and prior research findings.

Descriptive Data

We calculated descriptive statistics for the total number of observed print references during interactions. For children, the number of observed print references ranged from 0 to 51, with an average of approximately 12 (M = 11.97, SD = 12.37). For parents, the number of observed print references ranged from 0 to 23, with an average of approximately 6 (M = 5.6, SD = 5.71). For histograms displaying count data for the total number of observed print references from parents and children during the 4-min interactions, see Figures 1 and 2. Counts and types of print references for each dyad, as well as the amount of time coded, are included in Supplemental Material S2.

Before completing regression analyses, we used Spearman's correlation analyses and Kruskal–Wallis tests to assess the relationships between reading quantity, print references, parent perceived self-efficacy, developmental knowledge, and child sex. Refer to Tables 3 and 4 for correlations. We included psychosocial and demographic variables in regression models, removing those that did not impact key findings. This allowed us to explore the role of parent- and child-level influences on the association between reading quantity and print referencing. Detailed discussion will follow by objective.

Child Print References

We evaluated correlations between child print references and other aspects of the home literacy environment before building regression models. Child sex and print references were significantly associated, $\chi^2(1) = 6.040$, p = .014. On average, boys used more print references than girls (boys: M = 17.44, SD = 14.34; girls: M = 5.71, SD = 5.01). Given evidence of possible sex differences in early literacy engagement (Baroody & Diamond, 2013) and achievement (Deasley et al., 2018), we explored the role of child sex as a moderator of print referencing. Thus, we included an interaction term for child sex and quantity of reading. All model output is included in Table 5.

Table 3. Correlation table for continuous variables used in regression analyses.

Variable	1	2	3	4	5
1. Perceived self-efficacy					
2. Knowledge of development	.229				
3. Weekly minutes of reading	.305	.167			
4. Weekly reading episodes	.437*	.35	.823**		
5. Parent print references	.429*	.294†	.136	.437*	
6. Child print references	−.146	.033	−.05	.095	.367

Note. Spearman's rank-order correlation coefficients are displayed in the table.

*p < .05. **p < .001. †p < .1.

Table 4. Correlation table for child sex and variables used in regression analyses

Variable	Child sex	
	χ^2	*df*
Parent print references	3.103†	1
Child print references	6.040*	1
Weekly reading episodes	0.135	1
Weekly minutes of reading	0.193	1
Perceived self-efficacy	0.008	1
Knowledge of development	1.130	1

Note. Kruskal–Wallis statistic (χ^2) and degrees of freedom are displayed in this table.

*p < .05. †p < .1.

Reading Frequency

We first created a regression model to assess the relationship between reported frequency of at-home reading (i.e., weekly reading episodes) and child print references. Deviance testing revealed adequate model fit (p < .001). There was not a significant relationship between reading frequency and children's use of print references (B = 0.012, p = .641). However, child sex was a significant and positive predictor of print references (B = 1.336, p = .016), with a rate ratio of 3.805. This means that, with additional weekly reading episodes, male children in our sample used almost 4 times as many print references as female children. The interaction term was not significant (B = −0.019, p = .614).

Reading Time

To evaluate the association between reported reading time and children's print references, we examined weekly minutes of reading as a predictor variable of interest. Deviance testing revealed sufficient model fit (p < .001). Weekly minutes of reading significantly and negatively predicted child print references (B = −0.006, p = .025). However, inspection of the CI (95% CI [−0.012, 0.0004]) suggests that this finding has limited practical significance. The other variables included in the model, child sex (B = 0.722, p = .124) and the interaction term (B = 0.005, p = .086), were not significantly associated with print references.

Parent Print References

Correlation analyses revealed a significant correlation between parent print references and perceived self-efficacy

Table 5. Results from regression modeling for child print references.

Model 1: Reading frequency and child print references (n = 28)						
Coefficient	**Estimate**	**95% CI**	**Standard error**	***z* value**	***p* value**	**Rate ratio**
Intercept	1.598	[0.823, 2.44]	0.395	4.045	< .001**	4.944
Weekly reading episodes	0.012	[–0.041, 0.072]	0.027	0.466	.641	1.012
Child sex (male)	1.336	[0.240, 2.454]	0.551	2.426	.016*	3.805
Male sex × Weekly reading	–0.019	[–0.095, 0.055]	0.037	–0.505	.614	0.982
Model 2: Reading time and child print references (n = 27)						
Coefficient	**Estimate**	**95% CI**	**Standard error**	***z* value**	***p* value**	**Rate ratio**
Intercept	2.243	[1.585, 2.997]	0.326	6.879	< .001**	9.420
Minutes of reading per week	–0.006	[–0.012, –0.0004]	0.003	–2.243	.025*	0.994
Child sex (male)	0.722	[–0.249, 1.684]	0.469	1.539	.124	2.059
Male sex × Minutes of reading	0.005	[–0.001, 0.012]	0.003	1.715	.086	1.005

Note. CI = confidence interval.
*p < .05. **p < .001.

(r_S = .429, p = .018); the correlation with knowledge of child development was not significant (r_S = .294, p = .070). These parenting variables have been identified as influential for early interaction quality (Alper et al., 2021; Lin et al., 2015; Rowe et al., 2016). The correlation between print references and child sex was not significant, $\chi^2(1) = 3.103$, p = .078, although parents used more print references during reading interactions with male children (males: M = 6.88, SD = 6.15; females: M = 4.14, SD = 4.97). Thus, we included perceived self-efficacy, knowledge of child development, and child sex as additional explanatory variables in regression analyses. We included an interaction term between reading quantity and child sex given observed differences in male and female children's behaviors during the interaction. This decision was also informed by sex differences in parent perceptions of children's early reading attitudes (Baroody & Diamond, 2013; Baroody & Dobbs-Oates, 2011), which may influence parents' behavior. All model output is included in Table 6.

Table 6. Results from regression modeling for parent print references.

Model 1: Reading frequency and parent print references (n = 26)						
Coefficient	**Estimate**	**95% CI**	**Standard error**	***z* value**	***p* value (p_{adj} value)**	**Rate ratio**
Intercept	–5.418	[–7.93, –3.04]	1.241	–4.365	< .001** (< .001**)	0.004
Weekly reading episodes	0.037	[0.008, 0.067]	0.015	2.504	.012* (.018*)	1.038
Perceived self-efficacy	0.048	[0.025, 0.072]	0.012	3.982	< .001** (< .001**)	1.049
Knowledge of child development	0.085	[0.014, 0.162]	0.038	2.240	.025* (.029*)	1.089
Child sex (male)	1.407	[0.713, 2.131]	0.358	3.929	< .001** (< .001**)	4.085
Male sex × Weekly reading	–0.043	[–0.082, –0.004]	0.020	–2.185	.029* (.029*)	0.958
Model 2: Reading time and parent print references (n = 25)						
Coefficient	**Estimate**	**95% CI**	**Standard error**	***z* value**	***p* value**	**Rate ratio**
Intercept	–5.947	[–8.805, –3.284]	1.436	–4.141	< .001**	0.003
Minutes of reading per week	–0.001	[–0.004, 0.001]	0.001	–0.883	.377	0.999
Perceived self-efficacy	0.058	[0.032, 0.084]	0.014	4.256	< .001**	1.059
Knowledge of child development	0.099	[0.025, 0.177]	0.039	2.535	.011*	1.104
Child sex (male)	0.993	[0.296, 1.705]	0.357	2.784	.005*	2.700
Male sex × Minutes reading	–0.001	[–0.004, 0.003]	0.002	–0.289	.772	0.999

Note. CI = confidence interval.
*p < .05. **p < .001.

Reading Frequency

First, we evaluated the predictive utility of reported reading frequency (i.e., weekly reading episodes). Results from deviance testing ($p < .001$) suggested adequate model fit. Frequency of at-home reading significantly and positively predicted parents' print references ($B = 0.037$, $p[p_{adj}] = .012$ [.018]). The rate ratio was 1.038, suggesting that parents' print references increased by a multiplicative factor of approximately 1.04 with added weekly reading episodes.

Other aspects of the home literacy environment were also associated with parent print references. Parenting self-efficacy ($B = 0.048$, $p[p_{adj}] < .001$ [< .001]) and knowledge of child development ($B = 0.085$, $p[p_{adj}] = .025$ [.029]) were significantly associated with increased print references. The rate ratios for these two parenting-related variables were 1.049 and 1.089, respectively. There was also a significant positive relationship between child sex and parent print references ($B = 1.407$, $p[p_{adj}] < .001$ [< .001]), with a rate ratio of 4.085. The interaction between male child sex and weekly reading episodes was significantly and negatively associated with parent print references ($B = -0.043$, $p[p_{adj}] = .029$ [.029]). This suggests that, with more weekly reading episodes, parents used more print references with female, but not male, children, although parents generally used more print references with male children in our sample.

Reading Time

We also examined reported reading time (i.e., weekly minutes spent reading) as our predictor variable of interest. Deviance test results indicated satisfactory model fit ($p < .001$). Reading time was not a significant predictor of parents' print references ($B = -0.001$, $p = .377$).

However, there were significant relationships between print references and perceived self-efficacy ($B = 0.058$, $p < .001$), as well as knowledge of child development ($B = 0.099$, $p = .011$). Perceived self-efficacy and developmental knowledge positively and significantly predicted print references, with rate ratios of 1.059 and 1.104, respectively. There was also a significant, positive association between child sex and parent print references ($B = 0.993$, $p = .005$), with a rate ratio of 2.700. The interaction term was not significant ($B = -0.001$, $p = .772$).

Discussion

The purpose of this study was to examine the association between parent-reported quantity of at-home reading and the observed quality of shared-reading interactions, adjusting for parent- and child-level factors. We used parent report to calculate weekly reading frequency and time, as both measurements are used clinically (High et al., 2000; Nagamine et al., 2001; Needlman et al., 2005; Read Aloud 15 Minutes, n.d.). We coded recorded parent–child book sharing for use of print references, which we used to measure interaction quality. We found considerable variability in the number of observed print references in our sample of dyads with a high socioeconomic risk. These results align with prior research documenting the heterogeneity of interaction quality within income groups (Hirsh-Pasek et al., 2015; Malin et al., 2014).

We found that weekly reading time significantly and negatively predicted children's use of print references. Although this relationship was statistically significant, the practical significance may be limited given the small effect size (i.e., rate ratio). These results do not support our hypothesis. For parents, we found that weekly shared-reading episodes positively and significantly predicted print references. These data support our hypothesis. In addition to reading frequency, we found that parents' perceived self-efficacy, developmental knowledge, and male child sex significantly and positively predicted their print references. We also found a significant, positive interaction between weekly reading episodes and male child sex for parent print references. Overall, neither measurement of reading quantity predicted both child and parent print references. This suggests that quantitative measures alone may not fully capture qualitative aspects of early reading interactions, in the context of the home literacy environment.

Predicting Quality of Early Reading Interactions

Quantitative Measures of At-Home Reading

We found that reading frequency, but not time, was aligned with parent print references. This relates to previous research linking reading frequency and parent use of high-quality strategies during book sharing (Anderson et al., 2019a, 2019b). It is possible that dyads who read together more frequently have more opportunities to engage in and practice book sharing, which may support development of high-quality reading behaviors. However, frequency of at-home reading did not predict children's print references. Child print references are important to consider, given that they reflect preliteracy skills (Hammill, 2004; Justice et al., 2008) and may support literacy outcomes (Piasta et al., 2012). Moreover, children's outward engagement and enjoyment of reading increases parents' positive feelings toward the activity and the likelihood of regular reading interactions in the future (Preece & Levy, 2020). Thus, measures of weekly reading frequency fail to capture print-focused contributions from parents and children.

Our analyses suggested that reported time spent reading each week did not predict parents' observed print

references. The relationship between minutes of reading and children's print references is less straightforward. Although there was a significant negative relationship between these two variables, the small rate ratio suggests little clinical relevance. More research is needed to examine the association between time spent reading and children's print references.

Parent Knowledge and Perceptions

In regression models for parent print references, we also included measures of developmental knowledge and perceived self-efficacy. When measures of at-home reading frequency and time were used, these two variables significantly and positively predicted parents' print references. This suggests that measures of parents' knowledge of child development and perceived self-efficacy may provide predictions of their likelihood to use beneficial reading strategies, such as print referencing, even after adjusting for reading quantity.

Findings from our study contribute to the existing evidence linking parents' knowledge of development with positive practices and outcomes related to language and literacy. Longitudinal data show that parents' developmental knowledge during infancy is directly related to children's later literacy abilities (Rowe et al., 2016). Rowe et al. found that developmental knowledge also mediates the impact of parent education on child language and literacy at the age of 4 years. Knowledge of child development also may contribute to mothers' use of lengthier, complex utterances and vocabulary during early interactions (Rowe, 2008; Vernon-Feagans et al., 2008).

Our results also add to the evidence base related to self-efficacy and early parent–child interactions, which is somewhat mixed concerning literacy. Although a measure of perceived parenting self-efficacy is positively associated with early language interaction quality (Alper et al., 2021; Jones & Prinz, 2005), a general measure of parents' perceived self-efficacy failed to predict use of high-quality reading strategies, including print references, within an intervention (Alper et al., 2020). Similarly, perceived self-efficacy related to parenting and resilience does not seem to predict children's emergent literacy or outcomes (Heath et al., 2014).

However, there is evidence to suggest that parents' beliefs related to reading, including their perceived self-efficacy, shape child literacy outcomes (DeBaryshe, 1995). Literacy-related self-efficacy may mediate the impact of maternal education on children's reading outcomes (Cottone, 2012; Curenton & Justice, 2008). Our study, which used a measurement of parent self-efficacy related to teaching and play, supports an association between these perceptions and parents' use of print references, an indicator of high-quality reading interactions. More research is needed to determine how parental self-efficacy impacts the quality of early shared-reading interactions and the degree to which various domains of self-efficacy shape this relationship.

Child Sex

Child sex was a significant, positive predictor of children's print references. Within our sample, male children used more print references than female children. These results were surprising and may be influenced by the inclusion of book handling (i.e., opening/closing books, turning pages) as a print reference. Book handling was the most frequently observed type of child print reference, and male children used significantly more than female children (female children: $M = 4.86$, $SD = 4.19$; male children: $M = 15$, $SD = 13.31$; $U = 53.5$, $p = .015$). Thus, it is possible that the high counts of book handling from male children account for the sex-related findings. Given our small sample size and considerable variability, few conclusions can be drawn from these findings. More research is needed regarding possible sex differences in the frequency and type of child print references.

Our findings also indicate that child sex may predict parents' print referencing behavior. Reading with a male child significantly predicted parents' use of print references. There was also a significant interaction between reading frequency and child sex for parents' print references. Parents may perceive male children as less interested in reading than female children (Baroody & Diamond, 2013; Baroody & Dobbs-Oates, 2011). Thus, parents in our sample may have used more print references with male children to maintain interest on a task they perceived to be nonpreferred. However, this is speculative, and further research is needed to evaluate sex differences in parent perceptions of children and how these relate to print referencing.

Limitations and Future Directions

This was a secondary analysis using previously collected data (Luo et al., 2019). The recorded reading interactions were captured with a single camera in naturalistic settings. Several videos included interruptions and instances where participants or objects were out of frame. To avoid overestimating print references, we only coded those that were entirely visible on camera. This conservative approach may have underestimated print references. In addition, our measurement of reading frequency did not differentiate between shared and independent reading. There may be variation in how parents interpreted the question, which may have impacted our findings.

There is also a possibility that unmeasured variables, such as genetic data from dyads, influenced reading behavior. Previous research points to genetic and environmental contributions to early literacy; future studies are needed to determine how these forces interact to shape

at-home shared reading (Hart et al., 2021; Petrill et al., 2010). Similarly, this study focused solely on print referencing as a measure of reading interaction quality. This focus may have impacted our findings, and use of alternative or composite measures of interaction quality may lead to different results. Future research may examine how reading quantity may be associated with various measures of quality, such as asking open-ended questions or defining words in text, and expanding upon or repeating child utterances (Zevenbergen & Whitehurst, 2003).

The limited sample size in this study is another limitation. This may have reduced statistical power and contributed to the considerable variability in observed print references. The sample size also limits the generalizability of our results, particularly given the heterogeneity in child language outcomes in populations with a high socioeconomic risk (Hirsh-Pasek et al., 2015; Song et al., 2014). Similarly, our analyses used data from a single, brief parent–child interaction. The degree to which the limited amount of time analyzed is characteristic of all dyadic reading interactions is unclear. Further investigations with larger sample sizes and multiple data points are needed to examine the relationship between quantity and quality of reading interactions.

Clinical Implications

Findings from this study may be relevant to clinicians aiming to support early literacy within at-risk populations. Although our results suggested that quantitative measurements alone do not fully capture interaction quality, a measurement of reading frequency was relatively informative. We found that parent-reported episodes of reading per week, but not minutes, were associated with their use of print referencing strategies. Early interventionists may consider using weekly reading episodes, rather than minutes of reading, in their recommendations to parents of young children. Similarly, using broad measurements of frequency as intervention outcome measures may most accurately reflect interaction quality.

These results also highlight the potential utility of perceived parenting self-efficacy and knowledge in reflecting quality of early reading interactions. We found that these measures predicted parents' print references equally as well as reading frequency. Although obtaining these data from parents may lead to longer data collection sessions, they would provide insight on other qualitative aspects of early language and literacy interactions (Alper et al., 2021; Rowe et al., 2016). Parents' perceived self-efficacy and developmental knowledge may also be useful to supplement parent-reported data, which may be vulnerable to inaccurate reporting due to recall error or social desirability bias (Morsbach & Prinz, 2006).

Overall, we found that quantitative measures alone do not fully capture print references, one aspect of interaction quality, from parents and children during shared reading. Although reported reading frequency predicted parents' print references, it failed to predict those from children. Similarly, reported reading time failed to predict parent print references and yielded conflicting results for children. These results suggest that alternative or additional outcome measures may be beneficial for professionals interested in promoting enriching early reading interactions within populations with a high risk.

Acknowledgments

This research was supported by grants from the William Penn Foundation and Bezos Family Foundation, which included salary and research support (awarded to Rebecca M. Alper and Rufan Luo). The funders do not have oversight of manuscript preparation, submission, or presentation of findings. The authors are all involved professionally in research and practice related to early intervention. Thus, we have an intellectual and professional interest in the research.

The data analyzed for this study were collected as part of research supported by the William Penn Foundation (45-15; Hirsh-Pasek, PI) and Bezos Family Foundation (Hirsh-Pasek, PI). Rebecca M. Alper and Rufan Luo received salary and research support via these grants. The funders had no role in study design, data collection, analysis, interpretation, or publication. The opinions expressed in this article are those of the authors and do not necessarily reflect the views of the William Penn Foundation or Bezos Family Foundation. Parts of these data have been presented at conferences.

References

Adamson, L. B., Kaiser, A. P., Tamis-LeMonda, C. S., Owen, M. T., & Dimitrova, N. (2020). The developmental landscape of early parent-focused language intervention. *Early Childhood Research Quarterly, 50,* 59–67. https://doi.org/10.1016/j.ecresq.2018.11.005

Alborough, J. (2009). *Hug*. Candlewick Press.

Alper, R. M., Beiting, M., Luo, R., Jaen, J., Peel, M., Levi, O., Robinson, C., & Hirsh-Pasek, K. (2021). Change the things you can: Modifiable parent characteristics predict high-quality early language interaction within socioeconomic status. *Journal of Speech, Language, and Hearing Research, 64*(6), 1992–2004. https://doi.org/10.1044/2021_JSLHR-20-00412

Alper, R. M., Hurtig, R. R., & McGregor, K. K. (2020). The role of maternal psychosocial perceptions in parent-training programs: A preliminary randomized controlled trial. *Journal of Child Language, 47*(2), 358–381. https://doi.org/10.1017/S0305000919000138

Anderson, K. L., Atkinson, T. S., Swaggerty, E. A., & O'Brien, K. (2019a). Examining relationships between home-based shared book reading practices and children's language/literacy skills at kindergarten entry. *Early Child Development and Care, 189*(13), 2167–2182. https://doi.org/10.1080/03004430.2018.1443921

Anderson, K. L., Atkinson, T. S., Swaggerty, E. A., & O'Brien, K. (2019b). Exploring the short-term impacts of a community-based

book distribution program. *Literacy Research and Instruction, 58*(2), 84–104. https://doi.org/10.1080/19388071.2019.1579010

Baroody, A. E., & Diamond, K. E. (2013). Measures of preschool children's interest and engagement in literacy activities: Examining gender differences and construct dimensions. *Early Childhood Research Quarterly, 28*(2), 291–301. https://doi.org/10.1016/j.ecresq.2012.07.002

Baroody, A. E., & Dobbs-Oates, J. (2011). Child and parent characteristics, parental expectations, and child behaviours related to preschool children's interest in literacy. *Early Child Development and Care, 181*(3), 345–359. https://doi.org/10.1080/03004430903387693

Becker, M., McElvany, N., & Kortenbruck, M. (2010). Intrinsic and extrinsic reading motivation as predictors of reading literacy: A longitudinal study. *Journal of Educational Psychology, 102*(4), 773–785. https://doi.org/10.1037/a0020084

Bingham, G. E. (2007). Maternal literacy beliefs and the quality of mother–child book-reading interactions: Assoications with children's early literacy development. *Early Education and Development, 18*(1), 23–49. https://doi.org/10.1080/10409280701274428

Bracken, S. S., & Fischel, J. E. (2008). Family reading behavior and early literacy skills in preschool children from low-income backgrounds. *Early Education and Development, 19*(1), 45–67. https://doi.org/10.1080/10409280701838835

Bronfenbrenner, U., & Morris, P. A. (2007). The bioecological model of human development. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (pp. 793–828). Wiley. https://doi.org/10.1002/9780470147658.chpsy0114

Burgess, S. R., Hecht, S. A., & Lonigan, C. J. (2002). Relations of the home literacy environment (HLE) to the development of reading-related abilities: A one-year longitudinal study. *Reading Research Quarterly, 37*(4), 408–426. https://doi.org/10.1598/RRQ.37.4.4

Bus, A. G., van IJzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research, 65*(1), 1–21. https://doi.org/10.3102/00346543065001001

Center for Prevention Research and Development. (2016). *Illinois maternal infant and early childhood home visiting: 4th annual benchmark and outcome technical report*. https://cprd.illinois.edu/files/2017/11/MIECHV_AnnualReport_2016.pdf

Chen, S.-Y., Feng, Z., & Yi, X. (2017). A general introduction to adjustment for multiple comparisons. *Journal of Thoracic Disease, 9*(6), 1725–1729. https://doi.org/10.21037/jtd.2017.05.34

Coleman, P. K., & Karraker, K. H. (2003). Maternal self-efficacy beliefs, competence in parenting, and toddlers' behavior and developmental status. *Infant Mental Health Journal, 24*(2), 126–148. https://doi.org/10.1002/imhj.10048

Cottone, E. A. (2012). Preschoolers' emergent literacy skills: The mediating role of maternal reading beliefs. *Early Education and Development, 23*(3), 351–372. https://doi.org/10.1080/10409289.2010.527581

Crain-Thoreson, C., Dahlin, M. P., & Powell, T. A. (2001). Parent–child interaction in three conversational contexts: Variations in style and strategy. *New Directions for Child and Adolescent Development, 2001*(92), 23–38. https://doi.org/10.1002/cd.13

Curenton, S. M., & Justice, L. M. (2008). Children's preliteracy skills: Influence of mothers' education and beliefs about shared-reading interactions. *Early Education and Development, 19*(2), 261–283. https://doi.org/10.1080/10409280801963939

Deasley, S., Evans, M. A., Nowak, S., & Willoughby, D. (2018). Sex differences in emergent literacy and reading behaviour in junior kindergarten. *Canadian Journal of School Psychology, 33*(1), 26–43. https://doi.org/10.1177/0829573516645773

DeBaryshe, B. D. (1995). Maternal belief systems: Linchpin in the home reading process. *Journal of Applied Developmental Psychology, 16*(1), 1–20. https://doi.org/10.1016/0193-3973(95)90013-6

Dolly Parton's Imagination Library. (2021). *About Dolly Parton's Imagination Library*. https://imaginationlibrary.com/about-us/

Duff, D., Tomblin, J. B., & Catts, H. (2015). The influence of reading on vocabulary growth: A case for a Matthew effect. *Journal of Speech, Language, and Hearing Research, 58*(3), 853–864. https://doi.org/10.1044/2015_JSLHR-L-13-0310

Evans, M. A., Williamson, K., & Pursoo, T. (2008). Preschoolers' attention to print during shared book reading. *Scientific Studies of Reading, 12*(1), 106–129. https://doi.org/10.1080/10888430701773884

Ezell, H. K., & Justice, L. M. (1998). A pilot investigation of parents' questions about print and pictures to preschoolers with language delay. *Child Language Teaching and Therapy, 14*(3), 273–278. https://doi.org/10.1177/026565909801400303

Gamer, M., Lemon, J., Fellows, I., & Singh, P. (2019). *irr: Various coefficients of interrater reliability and agreement* (0.84.1) [Computer software]. https://CRAN.R-project.org/package=irr

Grolig, L. (2020). Shared storybook reading and oral language development: A bioecological perspective. *Frontiers in Psychology, 11,* 1818. https://doi.org/10.3389/fpsyg.2020.01818

Hallgren, K. A. (2012). Computing inter-rater reliability for observational data: An overview and tutorial. *Tutorials in Quantitative Methods for Psychology, 8*(1), 23–34. https://doi.org/10.20982/tqmp.08.1.p023

Hammett, L. A., van Kleeck, A., & Huberty, C. J. (2003). Patterns of parents' extratextual interactions during book sharing with preschool children: A cluster analysis study. *Reading Research Quarterly, 38*(4), 442–443, 445–468.

Hammill, D. D. (2004). What we know about correlates of reading. *Exceptional Children, 70*(4), 453–469. https://doi.org/10.1177/001440290407000405

Hart, S. A., Little, C., & van Bergen, E. (2021). Nurture might be nature: Cautionary tales and proposed solutions. *npj Science of Learning, 6*(1), 2. https://doi.org/10.1038/s41539-020-00079-z

Heath, S. M., Bishop, D. V. M., Bloor, K. E., Boyle, G. L., Fletcher, J., Hogben, J. H., Wigley, C. A., & Yeong, S. H. M. (2014). A spotlight on preschool: The influence of family factors on children's early literacy skills. *PLOS ONE, 9*(4), Article e95255. https://doi.org/10.1371/journal.pone.0095255

High, P. C., LaGasse, L., Becker, S., Ahlgren, I., & Gardner, A. (2000). Literacy promotion in primary care pediatrics: Can we make a difference? *Pediatrics, 105*(4, Pt. 2), 927–934. https://doi.org/10.1542/peds.105.S3.927

Hilbe, J. (2011). *Negative binomial regression*. Cambridge University Press. https://doi.org/10.1017/CBO9780511973420

Hirsh-Pasek, K., Adamson, L. B., Bakeman, R., Owen, M. T., Golinkoff, R. M., Pace, A., Yust, P. K. S., & Suma, K. (2015). The contribution of early communication quality to low-income children's language success. *Psychological Science, 26*(7), 1071–1083. https://doi.org/10.1177/0956797615581493

Huang, F. L., & Cornell, D. G. (2012). Pick your Poisson: A tutorial on analyzing counts of student victimization data. *Journal of School Violence, 11*(3), 187–206. https://doi.org/10.1080/15388220.2012.682010

Hume, L. E., Allan, D. M., & Lonigan, C. J. (2016). Links between preschoolers' literacy interest, inattention, and emergent literacy skills. *Learning and Individual Differences, 47,* 88–95. https://doi.org/10.1016/j.lindif.2015.12.006

Jones, T. L., & Prinz, R. J. (2005). Potential roles of parental self-efficacy in parent and child adjustment: A review. *Clinical Psychology Review, 25*(3), 341–363. https://doi.org/10.1016/j.cpr.2004.12.004

Justice, L. M., Chen, J., Jiang, H., Tambyraja, S., & Logan, J. (2020). Early-literacy intervention conducted by caregivers of children with language impairment: Implementation patterns using survival analysis. *Journal of Autism and Developmental Disorders, 50*(5), 1668–1682. https://doi.org/10.1007/s10803-019-03925-1

Justice, L. M., & Ezell, H. K. (2000). Enhancing children's print and word awareness through home-based parent intervention. *American Journal of Speech-Language Pathology, 9*(3), 257–269. https://doi.org/10.1044/1058-0360.0903.257

Justice, L. M., & Ezell, H. K. (2002). Use of storybook reading to increase print awareness in at-risk children. *American Journal of Speech-Language Pathology, 11*(1), 17–29. https://doi.org/10.1044/1058-0360(2002/003)

Justice, L. M., Kaderavek, J. N., Fan, X., Sofka, A., & Hunt, A. (2009). Accelerating preschoolers' early literacy development through classroom-based teacher–child storybook reading and explicit print referencing. *Language, Speech, and Hearing Services in Schools, 40*(1), 67–85. https://doi.org/10.1044/0161-1461(2008/07-0098)

Justice, L. M., Logan, J. R., & Damschroder, L. (2015). Designing caregiver-implemented shared-reading interventions to overcome implementation barriers. *Journal of Speech, Language, and Hearing Research, 58*(6), S1851–S1863. https://doi.org/10.1044/2015_JSLHR-L-14-0344

Justice, L. M., Pullen, P. C., & Pence, K. (2008). Influence of verbal and nonverbal references to print on preschoolers' visual attention to print during storybook reading. *Developmental Psychology, 44*(3), 855–866. https://doi.org/10.1037/0012-1649.44.3.855

Justice, L. M., Skibbe, L. E., McGinty, A. S., Piasta, S. B., & Petrill, S. (2011). Feasibility, efficacy, and social validity of home-based storybook reading intervention for children with language impairment. *Journal of Speech, Language, and Hearing Research, 54*(2), 523–538. https://doi.org/10.1044/1092-4388(2010/09-0151)

Justice, L. M., & Sofka, A. (2010). *Engaging children with print: Building early literacy skills through quality read-alouds*. Guilford Press.

Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine, 15*(2), 155–163. https://doi.org/10.1016/j.jcm.2016.02.012

Lin, J., Reich, S. M., Kataoka, S., & Farkas, G. (2015). Maternal reading self-efficacy associated with perceived barriers to reading. *Child Development Research, 2015,* 1–6. https://doi.org/10.1155/2015/218984

Logan, J. A. R., Justice, L. M., Yumus, M., & Chaparro-Moreno, L. J. (2020). When children are not read to at home: The million word gap. *Journal of Developmental & Behavioral Pediatrics, 40*(5), 383–386. https://doi.org/10.1097/DBP.0000000000000657

Lonigan, C. J., Bloomfield, B. G., Anthony, J. L., Bacon, K. D., Phillips, B. M., & Samwel, C. S. (1999). Relations among emergent literacy skills, behavior problems, and social competence in preschool children from low- and middle-income backgrounds. *Topics in Early Childhood Special Education, 19*(1), 40–53. https://doi.org/10.1177/027112149901900104

Lüdecke, D. (2021). *sjPlot: Data visualization for statistics in social science*. https://CRAN.R-project.org/package=sjPlot

Luo, R., Alper, R. M., Hirsh-Pasek, K., Mogul, M., Chen, Y., Masek, L. R., Paterson, S., Pace, A., Adamson, L. B., Bakeman, R., Golinkoff, R. M., & Owen, M. T. (2019). Community-based, caregiver-implemented early language intervention in high-risk families: Lessons learned. *Progress in Community Health Partnerships, 13*(3), 283–291. http://dx.doi.org.libproxy.temple.edu/10.1353/cpr.2019.0056

Luo, R., Pace, A., Levine, D., Iglesias, A., de Villiers, J., Golinkoff, R. M., Wilson, M. S., & Hirsh-Pasek, K. (2021). Home literacy environment and existing knowledge mediate the link between socioeconomic status and language learning skills in dual language learners. *Early Childhood Research Quarterly, 55,* 1–14. https://doi.org/10.1016/j.ecresq.2020.10.007

MacPhee, D. (1981). *Manual: Knowledge of infant development inventory* [Unpublished manuscript].

Malin, J. L., Cabrera, N. J., & Rowe, M. L. (2014). Low-income minority mothers' and fathers' reading and children's interest: Longitudinal contributions to children's receptive vocabulary skills. *Early Childhood Research Quarterly, 29*(4), 425–432. https://doi.org/10.1016/j.ecresq.2014.04.010

Mangold. (2020). *INTERACT user guide*. Mangold International GmbH. http://www.mangold-international.com

McGraw, K. O., & Wong, S. P. (1996). Forming inferences about some intraclass correlation coefficients. *Psychological Methods, 1*(1), 30–46. https://doi.org/10.1037/1082-989X.1.1.30

McNeish, D. (2018). Thanks coefficient alpha, we'll take it from here. *Psychological Methods, 23*(3), 412–433. https://doi.org/10.1037/met0000144

Miller, L. E., Perkins, K. A., Dai, Y. G., & Fein, D. A. (2017). Comparison of parent report and direct assessment of child skills in toddlers. *Research in Autism Spectrum Disorders, 41-42,* 57–65. https://doi.org/10.1016/j.rasd.2017.08.002

Mol, S. E., & Bus, A. G. (2011). To read or not to read: A meta-analysis of print exposure from infancy to early adulthood. *Psychological Bulletin, 137*(2), 267–296. https://doi.org/10.1037/a0021890

Mol, S. E., & Neuman, S. B. (2014). Sharing information books with kindergartners: The role of parents' extra-textual talk and socioeconomic status. *Early Childhood Research Quarterly, 29*(4), 399–410. https://doi.org/10.1016/j.ecresq.2014.04.001

Morrow, L. M., O'Connor, E. M., & Smith, J. K. (1990). Effects of a story reading program on the literacy development of at-risk kindergarten children. *Journal of Reading Behavior, 22*(3), 255–275. https://doi.org/10.1080/10862969009547710

Morsbach, S. K., & Prinz, R. J. (2006). Understanding and improving the validity of self-report of parenting. *Clinical Child and Family Psychology Review, 9*(1), 1–21. http://dx.doi.org.libproxy.temple.edu/10.1007/s10567-006-0001-5

Myrtil, M. J., Justice, L. M., & Jiang, H. (2019). Home-literacy environment of low-income rural families: Association with child- and caregiver-level characteristics. *Journal of Applied Developmental Psychology, 60,* 1–10. https://doi.org/10.1016/j.appdev.2018.10.002

Nagamine, W. H., Ishida, J. T., Williams, D. R., Yamamoto, R. I., & Yamamoto, L. G. (2001). Child literacy promotion in the emergency department. *Pediatric Emergency Care, 17*(1), 19–21. https://doi.org/10.1097/00006565-200102000-00005

National Center for Education Statistics. (2019). *2019 NAEP reading assessment highlights (Statistical Analysis Report NCES 2020012)*. https://www.nationsreportcard.gov/highlights/reading/2019/

Needlman, R., Toker, K. H., Dreyer, B. P., Klass, P., & Mendelsohn, A. L. (2005). Effectiveness of a primary care intervention to support reading aloud: A multicenter evaluation. *Ambulatory Pediatrics, 5*(4), 209–215. https://doi.org/10.1367/A04-110R.1

Ozturk, G., Hill, S., & Yates, G. (2016). Family context and five-year-old children's attitudes toward literacy when they are

learning to read. *Reading Psychology, 37*(3), 487–509. https://doi.org/10.1080/02702711.2015.1066909

Peacock-Chambers, E., Martin, J. T., Necastro, K. A., Cabral, H. J., & Bair-Merritt, M. (2017). The influence of parental self-efficacy and perceived control on the home learning environment of young children. *Academic Pediatrics, 17*(2), 176–183. https://doi.org/10.1016/j.acap.2016.10.010

Petrill, S. A., Hart, S. A., Harlaar, N., Logan, J., Justice, L. M., Schatschneider, C., Thompson, L., DeThorne, L. S., Deater-Deckard, K., & Cutting, L. (2010). Genetic and environmental influences on the growth of early reading skills. *The Journal of Child Psychology and Psychiatry, 51*(6), 660–667. https://doi.org/10.1111/j.1469-7610.2009.02204.x

Phillips, B. M., & Lonigan, C. J. (2009). Variations in the home literacy environment of preschool children: A cluster analytic approach. *Scientific Studies of Reading, 13*(2), 146–174. https://doi.org/10.1080/10888430902769533

Phillips, G., & McNaughton, S. (1990). The practice of storybook reading to preschool children in mainstream New Zealand families. *Reading Research Quarterly, 25*(3), 196–212. https://doi.org/10.2307/748002

Piasta, S. B., Justice, L. M., McGinty, A. S., & Kaderavek, J. N. (2012). Increasing young children's contact with print during shared reading: Longitudinal effects on literacy Achievement. *Child Development, 83*(3), 810–820. https://doi.org/10.1111/j.1467-8624.2012.01754.x

Pillinger, C., & Wood, C. (2014). Pilot study evaluating the impact of dialogic reading and shared reading at transition to primary school: Early literacy skills and parental attitudes. *Literacy, 48*(3), 155–163. https://doi.org/10.1111/lit.12018

Preece, J., & Levy, R. (2020). Understanding the barriers and motivations to shared reading with young children: The role of enjoyment and feedback. *Journal of Early Childhood Literacy, 20*(4), 631–654. https://doi.org/10.1177/1468798418779216

Priddy, R. (2008). *Numbers, colors, shapes*. St. Martin's Press.

Raikes, H., Pan, B. A., Luze, G., Tamis-LeMonda, C. S., Brooks-Gunn, J., Constantine, J., Tarullo, L. B., Raikes, H. A., & Rodriguez, E. T. (2006). Mother–child bookreading in low-income families: Correlates and outcomes during the first three years of life. *Child Development, 77*(4), 924–953. https://doi.org/10.1111/j.1467-8624.2006.00911.x

R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-project.org/

Reach Out and Read. (n.d.). *What we do*. Retrieved January 4, 2021, from https://reachoutandread.org/what-we-do/

Read Aloud 15 Minutes. (n.d.). *Importance of reading aloud*. Retrieved February 12, 2021, from https://readaloud.org/importance.html

Reading Is Fundamental. (n.d.). How we help. Retrieved January 4, 2021, from https://www.rif.org/how-we-help

Revelle, W. (2020). *psych: Procedures for psychological, psychometric, and personality research*. Northwestern University. https://CRAN.R-project.org/package=psych

Rowe, M. L. (2008). Child-directed speech: Relation to socioeconomic status, knowledge of child development and child vocabulary skill. *Journal of Child Language, 35*(1), 185–205. http://dx.doi.org.libproxy.temple.edu/10.1017/S0305000907008343

Rowe, M. L. (2018). Understanding socioeconomic differences in parents' speech to children. *Child Development Perspectives, 12*(2), 122–127. https://doi.org/10.1111/cdep.12271

Rowe, M. L., Denmark, N., Harden, B. J., & Stapleton, L. M. (2016). The role of parent education and parenting knowledge in children's language and literacy skills among White, Black, and Latino families. *Infant and Child Development, 25*(2), 198–220. https://doi.org/10.1002/icd.1924

Sachse, S., & Suchodoletz, W. V. (2008). Early identification of language delay by direct language assessment or parent report? *Journal of Developmental & Behavioral Pediatrics, 29*(1), 34–41. https://doi.org/10.1097/DBP.0b013e318146902a

Sawyer, B. E., Justice, L. M., Guo, Y., Logan, J. A. R., Petrill, S. A., Glenn-Applegate, K., Kaderavek, J. N., & Pentimonti, J. M. (2014). Relations among home literacy environment, child characteristics and print knowledge for preschool children with language impairment. *Journal of Research in Reading, 37*(1), 65–83. https://doi.org/10.1111/jrir.12008

Scarborough, H. S., & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review, 14*(3), 245–302. https://doi.org/10.1006/drev.1994.1010

Sevigny, P. R., & Loutzenhiser, L. (2010). Predictors of parenting self-efficacy in mothers and fathers of toddlers. *Child: Care, Health and Development, 36*(2), 179–189. https://doi.org/10.1111/j.1365-2214.2009.00980.x

Song, L., Spier, E. T., & Tamis-Lemonda, C. S. (2014). Reciprocal influences between maternal language and children's language and cognitive development in low-income families. *Journal of Child Language, 41*(2), 305–326. https://doi.org/10.1017/S0305000912000700

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*(4), 360–407. https://doi.org/10.1598/RRQ.21.4.1

Storch, S. A., & Whitehurst, G. J. (2001). The role of family and home in the literacy development of children from low-income backgrounds. *New Directions for Child and Adolescent Development, 2001*(92), 53. https://doi.org/10.1002/cd.15

Tamis-LeMonda, C. S., Custode, S., Kuchirko, Y., Escobar, K., & Lo, T. (2019). Routine language: Speech directed to infants during home activities. *Child Development, 90*(6), 2135–2152. https://doi.org/10.1111/cdev.13089

Tripepi, G., Jager, K. J., Dekker, F. W., Wanner, C., & Zoccali, C. (2007). Measures of effect: Relative risks, odds ratios, risk difference, and 'number needed to treat.' *Kidney International, 72*(7), 789–791. https://doi.org/10.1038/sj.ki.5002432

Venables, W. N., & Ripley, B. D. (2002). *Modern applied statistics with S* (4th ed.). Springer.

Vernon-Feagans, L., Pancsofar, N., Willoughby, M., Odom, E., Quade, A., & Cox, M. (2008). Predictors of maternal language to infants during a picture book task in the home: Family SES, child characteristics and the parenting environment. *Journal of Applied Developmental Psychology, 29*(3), 213–226. https://doi.org/10.1016/j.appdev.2008.02.007

White, G. C., & Bennetts, R. E. (1996). Analysis of frequency count data using the negative binomial distribution. *Ecology, 77*(8), 2549–2557. https://doi.org/10.2307/2265753

Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis*. Springer-Verlag. https://doi.org/10.1007/978-3-319-24277-4

Wiescholek, S., Hilkenmeier, J., Greiner, C., & Buhl, H. M. (2018). Six-year-olds' perception of home literacy environment and its influence on children's literacy enjoyment, frequency, and early literacy skills. *Reading Psychology, 39*(1), 41–68. https://doi.org/10.1080/02702711.2017.1361495

Zevenbergen, A. A., & Whitehurst, G. J. (2003). Dialogic reading: A shared picture book reading intervention for preschoolers. In *On reading books to children: Parents and teachers* (pp. 177–200). Erlbaum.