Print-Focused Read-Alouds in Preschool Classrooms: Intervention Effectiveness and Moderators of Child Outcomes

Laura M. Justice
The Ohio State University, Columbus

Anita S. McGinty
University of Virginia, Charlottesville

Shayne B. Piasta
The Ohio State University

Joan N. Kaderavek
University of Toledo, Toledo, OH

Xitao Fan
University of Virginia

I n the last decade, the percentage of 4-year-olds participating in center-based preschool programs has increased dramatically (Barnett, Hustedt, Friedman, Boyd, & Ainsworth, 2007). An important goal of state- and federally funded preschool programs, particularly those with targeted enrollment (e.g., Head Start), is to offset the myriad developmental risks associated with disability and poverty by improving children's readiness for schooling and, by extension, their short- and long-term academic success (e.g., Bowman, Donovan, & Burns, 2001). Speech-language pathologists (SLPs) often provide direct services to children in these programs who have identified language-learning disabilities, but also may provide indirect services involving a preventive

ABSTRACT: **Purpose:** This study was conducted to determine the effectiveness of teachers' use of a print-referencing style during whole-class read-alouds with respect to accelerating 4- and 5-year-old children's print-knowledge development. It also examined 8 specific child- and setting-level moderators to determine whether these influenced the relation between teachers' use of a print-referencing style and children's print-knowledge development.
Method: In this randomized controlled trial, 59 teachers were randomly assigned to 2 conditions. Teachers in the experimental group (*n* = 31) integrated explicit references to specified print targets within each of 120 read-aloud sessions conducted in their classrooms over a 30-week period; comparison teachers (*n* = 28) read the same set of book titles along the same schedule but read using their business-as-usual reading style. Children's gains over the 30-week period on a composite measure of print knowledge were compared for a subset of children who were randomly selected from the experimental (*n* = 201) and comparison (*n* = 178) classrooms.

Results: When controlling for fall print knowledge, child age, and classroom quality, children who experienced a print-referencing style of reading had significantly higher print knowledge scores in the spring than did children in the comparison classroom. None of the child-level (age, initial literacy skills, language ability) or setting-level characteristics (program type, instructional quality, average level of classroom socioeconomic status, teachers' education level, teachers' experience) significantly moderated intervention effects.
Clinical Implications: Considered in tandem with prior study findings concerning this approach to emergent literacy intervention, print-focused read-alouds appear to constitute an evidence-based practice with net positive impacts on children's literacy development.

KEY WORDS: emergent literacy, intervention, shared reading, preschool

orientation. Although the average dollar amount invested per child enrolled in public preschool programs is a fraction of the per-pupil investment for the K–12 segment of schooling (Barnett et al., 2007), policy makers want assurance that there are sufficient returns to justify the investment of discretionary funds to this sector of schooling, including provision of prevention-oriented interventions (Meisels, 2006).

One way to provide this assurance is to ensure that preschool educators and allied professionals have access to practices and programs with demonstrated causal impacts on children's growth in key developmental domains. Consequently, significant federal funds have recently been invested in studies that document the efficacy or effectiveness of specific classroom practices and programs (e.g., Jackson et al., 2007; Preschool Curriculum Evaluation Research Consortium, 2008). An efficacious practice or program is one that has demonstrated causal impacts on child outcomes under tightly controlled, optimal implementations (Flay et al., 2005). An increasing number of efficacy studies of direct relevance to the preschool sector have shown the positive, causal impacts that specific instructional practices can have on children's language and literacy development (e.g., DeBaryshe & Gorecki, 2007; Justice, Chow, Capellini, Flanigan, & Colton, 2003; Ukrainetz, Cooney, Dyer, Kysar, & Harris, 2000; van Kleeck, Vander Woude, & Hammett, 2006; Wasik, Bond, & Hindman, 2006). However, the most promising practices are those that are not only efficacious but also effective. An effective intervention is one that is shown to exert net positive effects on child outcomes when implemented in authentic field-based conditions with participants similar to those in the community for whom the intervention is designed (McCall, 2009; McDonald, Keesler, Kauffman, & Schneider, 2006). Interventions with demonstrated effectiveness are more likely to be disseminated broadly (Flay et al., 2005) and to be sustained within instructional contexts over time (McDonald et al., 2006).

The current study contributes to a growing literature that is concerned with establishing the effectiveness of specific preschool practices (e.g., Barnett et al., 2008; Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Fischel et al., 2007) by describing the effectiveness of a classroom-based read-aloud program involving teacher use of a print-focused reading style. The current study extends findings presented in a recent report that described the positive impacts of this particular intervention approach for the initial cohort (106 children) of a two-cohort study (see Justice, Kaderavek, Fan, Sofka, & Hunt, 2009). The present report presents findings for both cohorts of children ($n = 379$), including those described in our previous report. In addition, an important aim of the present study was to assess whether any observed effects of a print-referencing style of reading vary by specific child-level (age, initial literacy skills, language ability) and setting-level characteristics (program type, instructional quality, average level of classroom socioeconomic status, teachers' education level, teachers' experience); to our knowledge, questions of moderation (i.e., whether the intervention "works" only under certain conditions) have not been addressed previously in any papers on this intervention approach.

Emergent Literacy Development in Preschool Classroom Settings

The preschool years are a significant period of development during which young children acquire knowledge of the code- and meaning-based aspects of both written and spoken language (National Institute on Deafness and Other Communication Disorders, 2005; Sénéchal, LeFevre, Smith-Chant, & Colton, 2001; Storch & Whitehurst, 2002). This knowledge base is often referred to as emergent literacy to emphasize its precursory relation to conventional literacy abilities transcending word recognition, reading comprehension, and spelling (Whitehurst & Lonigan, 1998). Within the present study, our focus concerns children's development within one area of emergent literacy, namely, print knowledge. Print knowledge is a multidimensional construct that describes the young child's emerging knowledge about the forms and functions of written language (Justice & Ezell, 2001, 2004; Rowe, 2008; Storch & Whitehurst, 2002). Indices of print knowledge, including measures of print-concept knowledge, environmental print recognition, and alphabet knowledge, consistently exhibit moderate to strong predictive relations to children's later outcomes on measures of word recognition (e.g., Hammill, 2004; National Early Literacy Panel, 2009; Storch & Whitehurst, 2002). Not surprisingly, current preschool learning standards strongly emphasize the importance of children's exposure to practices that directly facilitate their print knowledge (e.g., Head Start Bureau, 2003; Ohio Department of Education, 2007; Virginia Department of Education, 2007).

In light of these trends, the research community has in recent years rigorously sought to identify specific practices and programs that have positive effects on children's development of print knowledge, particularly for those youngsters whose skills are low relative to peers so as to attenuate presumed risks for later reading difficulties (e.g., Aram & Biron, 2004; DeBaryshe & Gorecki, 2007; Fischel et al., 2007; Justice & Ezell, 2002; Justice et al., 2003; Wasik et al., 2006). One specific practice consistently garnering attention is that of the read-aloud, particularly the use of a dialogic reading style given its documented positive impacts on children's oral language skills in several efficacy trials involving teachers and/or parents (e.g., Crain-Thoreson & Dale, 1999; Hargrave & Sénéchal, 2000; Lonigan, Anthony, Bloomfield, Dyer, & Samwel, 1999; Whitehurst et al., 1988, 1994). Dialogic reading, as the term was originally defined in the literature by the intervention developers, involves teaching caregivers to use (a) evocative techniques to involve children as active participants in reading interactions, particularly open-ended questions, and (b) feedback strategies to provide advanced language models, particularly recasts, expansions, and corrective models (see Whitehurst et al., 1988). Since its inception, the primary goal of dialogic reading has been to bolster children's oral language skills, primarily vocabulary and grammar. A recent meta-analysis of experimental studies assessing the efficacy of dialogic-reading interventions showed that this type of interention had consistently positive impacts on children's language skills but no discernable impacts on other areas of development, such as print knowledge (What Works Clearinghouse, 2007; also see Mol, Bus, & de Jong, 2009, for a broader treatment of the effects of dialogic and interactive reading).

In general, the shared storybook reading context, or read-aloud, invites interest from researchers who are invested in developing and testing emergent literacy interventions because it is a routine with which many children are familiar and seem to enjoy (Reyes & Azuara, 2008; Yarosz & Barnett, 2001) and it requires few specialized materials beyond the text itself. However, the dialogic reading style appears to exhibit impacts that are specific to oral language and to have little demonstrable effect on "code-based" domains of emergent literacy, including print knowledge (see Sénéchal et al., 2001). This point is based on examination of both primary research reports

explicitly testing the efficacy of dialogic reading (e.g., Whitehurst et al., 1988) as well as meta-analyses that include only true experimental studies of dialogic reading (see What Works Clearinghouse, 2007). Indeed, the most ambitious assessment of dialogic-reading effects conducted to date, involving 207 preschoolers and their 16 teachers, found that dialogic reading had a negative effect on print-related measures (i.e., alphabet knowledge; see Wasik et al., 2006). On the basis of such findings, researchers have surmised that for read-alouds to have a direct and positive influence on children's development of code-based domains of emergent literacy, particularly print knowledge, adult readers must systematically and intentionally evoke the children's attention to and engagement with print within the text (e.g., Evans & Saint-Aubin, 2005; Justice & Ezell, 2004; Lovelace & Stewart, 2007).

Facilitating Print Knowledge Within the Context of Storybook-Reading Interactions

When we consider how children develop print knowledge, many theorists agree that children's understanding of print accumulates in large part through mediated contact with print during shared reading experiences (Aram & Levin, 2002; Bennett, Weigel, & Martin, 2002; Pick, Unze, Brownell, Drozdal, & Hopmann, 1978; Rowe, 2008; Snow, 1983). However, adult–child read-aloud interactions both within and beyond the early childhood classroom show considerable variation in the extent to which these learning opportunities provide children with direct contact with print (e.g., Dickinson & Smith, 1994; Hammett, van Kleeck, & Huberty, 2003; Sonnenschein & Munsterman, 2002; Yaden, Smolkin, & Conlon, 1989). This variation appears influential for how much print knowledge children acquire from repeated engagement in read-aloud experiences.

Research findings have demonstrated that adult readers can systematically evoke children's attention toward print by making verbal and nonverbal references to print, which is referred to as reading with a print-referencing style (Justice & Ezell, 2000, 2002; Lovelace & Stewart, 2007). This style differs from dialogic reading in that the latter is designed to facilitate oral language, particularly grammar and vocabulary, through use of a small set of evocative techniques and feedback strategies focused on these targets (e.g., open-ended questions, recasts, expansions). Although use of a print-referencing style is also designed to facilitate children's active involvement in reading interactions, its principal goal is to orient children to print within the storybook by verbal and nonverbal means. This reading style is based on research findings showing that when adults explicitly facilitate children's direct contact with the written code (e.g., letters, words, sentence, punctuation devices) using verbal and nonverbal references, children look much more frequently at print compared to typical reading interactions (Evans & Saint-Aubin, 2005; Evans, Williamson, & Pursoo, 2008; Justice, Pullen, & Pence, 2008), and their print knowledge increases rapidly in relatively short periods of time (Justice & Ezell, 2000, 2002). Particular ways in which adult readers might successfully and systematically evoke children's attention toward print (and consequently increase the rate of their learning about print) include asking questions about print and pointing to print (Justice & Ezell, 2000, 2002; Lovelace & Stewart, 2007). Research suggests that both verbal and nonverbal references to print are equally influential in evoking children's visual attention to print during read-alouds (Justice et al., 2008).

Interestingly, observational studies indicate that the prototypical read-aloud interaction between adults and preschool-age children includes very little direct, systematic contact with print (Evans et al., 2008; Ezell, Justice, & Parsons, 2000; Yaden, Smolkin, & MacGillivray, 1993). Research findings show that children typically receive little or no systematic guidance from adults (through verbal or nonverbal referencing of print) to attend to the print in storybooks in any meaningful way (Evans et al., 2008; Justice, Weber, Ezell, & Bakeman, 2002; Phillips & McNaughton, 1990; Yaden et al., 1993). As a result, even frequent prototypical book readings, at home or at school, do not tend to be associated with improvements in children's print knowledge (Justice & Ezell, 2000, 2002; Sénéchal, 2006). As researchers have increasingly speculated, read-aloud interactions in which children's attention is focused largely on the illustrations make little direct contribution to children's growth of print knowledge (Evans et al., 2008; Justice & Ezell, 2000, 2002; Justice et al., 2002; Yaden et al., 1993).

Importantly, a growing body of work shows that adult use of a print-referencing style when reading books with children—a style that includes systematic attention to print within a book through verbal and nonverbal references—can be readily learned by adults with only minimal instruction; in turn, this style can be feasibly implemented in a range of authentic educational environments, including the home (Justice & Ezell, 2000) and the preschool classroom as a small-group (Girolametto, Weitzman, Lefebvre, & Greenberg, 2007; Justice & Ezell, 2002), large-group (Justice et al., 2009), or one-on-one activity (Lovelace & Stewart, 2007). Positive impacts appear to extend beyond children who are typically developing (Justice & Ezell, 2000) to include those who are at risk due to poverty (Justice & Ezell, 2002) and those with communication disorders (Lovelace & Stewart, 2007).

The most recent description of the positive impacts of a print-referencing style on young children's print knowledge involved a subset of the participants in the present study. Justice and colleagues (2009) reported outcomes associated with 14 preschool teachers' use of a print-referencing style over an academic year as compared to nine teachers' use of a business-as-usual reading style. Teachers who used the print-referencing style systematically addressed a scope and sequence of 15 specific print-related targets (e.g., letters as units of words, print directionality) within the context of a print-referencing reading style; targets were rotated cyclically over 120 reading sessions conducted in their classrooms (4 sessions per week for 30 weeks). Intervention effects were estimated based on fall to spring gains on three measures of print knowledge (i.e., alphabet knowledge, print-concept knowledge, and name-writing ability) for 106 preschool children who were randomly selected from the 23 classrooms. Effect-size contrasts for the print-referencing style were medium in size (d = 0.42–0.56) for all three print knowledge measures, suggesting that children's participation in repeated read-alouds featuring an explicit focus on print increased the rate with which they learned about print.

An important feature of this approach to emergent literacy intervention, in light of its apparent efficacy, is its great potential for scalability as a robust "evidence-based" practice. A robust evidence-based practice is one that is supported by persuasive research evidence, including documentation not only of efficacy but also of effectiveness, and that can be feasibly implemented and is cost effective (McCall, 2009). Because print-focused reading may be readily employed at very low costs with few specialized materials or training, it has promise for scaling up should large-scale field studies support its effectiveness.

Scaling Up Promising Interventions

The efficacy of teacher (and parent) use of a print-referencing style has been reasonably well established by a series of small experimental trials that were conducted in a range of settings and using a variety of outcome measures (Justice & Ezell, 2000, 2002; Justice et al., 2009; Lovelace & Stewart, 2007). Efficacy studies are used to document causal relations between a specific intervention and a specific outcome; these types of studies are largely concerned with exerting tight controls over internal validity to support causal claims regarding the intervention (Robey, 2004). Effectiveness studies typically occur subsequent to establishing efficacy and are used to determine whether intervention benefits are apparent in more routine or ordinary settings and when the intervention is implemented by anticipated end users of a practice. Effectiveness studies are particularly useful for producing effect-size estimates that we can expect from more routine implementations (Robey, 2004).

Effectiveness studies are also important for determining whether interventions with demonstrated efficacy can, in fact, be scaled into ordinary settings; for this reason, these are also called scale-up studies (McDonald et al., 2006). Scale up studies often will include investigation of moderating variables that may affect intervention outcomes, as these studies usually involve implementation of an intervention in multiple settings with relatively large numbers of participants (Flay et al., 2005). Of interest is examining multilevel influences on the relation between an intervention and specific outcomes, such as individual features of children, teachers, and contexts in which the intervention takes place (McDonald et al., 2006). Our focus in this study was assessing the potential scalability of efficacious practices into early childhood settings, which can be challenging because there is considerable variability in these settings that can greatly influence intervention impacts (Barnett et al., 2007; Early et al., 2005). For instance, the educational background of early education teachers can range from less than a high school diploma to a graduate degree—a range not typically seen in the later grades. In prior studies of the efficacy of a print-referencing style of reading, children tended to receive intervention from highly educated research personnel (Justice & Ezell, 2002; Lovelace & Stewart, 2007). However, meta-analyses of book-reading interventions and their effects on children's language growth have shown that intervention effects are stronger when researchers implement an intervention compared to teachers (Mol et al., 2009). Effectiveness studies can help determine, for instance, whether the educational level of interventionists may serve to moderate intervention impacts, which is an issue we attend to in this report.

In the present work, we report findings from a randomized controlled trial (RCT) that was designed to test the effectiveness of preschool teachers' use of a print-referencing style in their classrooms. Although we discussed findings from this RCT previously (Justice et al., 2009), that study involved only the initial cohort (of two planned cohorts) and therefore provided only a preliminary assessment of intervention impacts. The present report examines intervention effectiveness for 59 teachers and 379 children to address the question "To what extent does teachers' use of a print-referencing style of reading over an academic year influence preschool children's print knowledge relative to business-as-usual read-alouds?" Extending beyond our recent report, the present work was also conducted to examine three questions that have not yet been addressed in the literature on this intervention approach. Because of the size of our present sample, including teachers and children from both cohorts in this RCT, we have sufficient statistical power to now address a variety of complementary research questions. Therefore, the second question was "To what extent does teachers' use of a print-referencing style of reading influence preschool children's language skills relative to business-as-usual read-alouds?" As we discussed previously in the literature review, a substantial research base supports the impact of shared reading experiences on children's language skills. It is unclear from any prior study of print referencing whether children's language skills are influenced, either positively or negatively, by exposure to this approach. Hypothetically, it could be surmised that an adult's efforts to increase a focus on print while reading to children could inhibit language-facilitating interactions (e.g., discussions about interesting words, predictions about story events). We therefore specifically assessed the effects of a print-referencing style of reading on children's language skills in the context of this study.

The remaining research questions explored whether effects of the intervention on children's print knowledge were moderated by a variety of child and classroom factors. The questions were: "To what extent is the impact of a print-referencing read-aloud style on children's print knowledge moderated by individual differences among children in age, pre-intervention literacy skill, and language ability?" and "To what extent is the impact of a print-referencing read-aloud style on children's print knowledge moderated by individual differences among classrooms, to include teachers' education and experience, program type, classroom composition, and classroom quality?"

METHOD

Research Design and Study Description

Project STAR. This two-state, two-cohort study, referred to as Project STAR (Sit Together and Read), involved 84 preschool teachers assigned randomly to three conditions and 551 children sampled from their classrooms. Teachers and children were enrolled in two sequential cohorts, with initial enrollment of a teacher/child occurring in either the 2005–2006 or 2006–2007 academic years, at which time teachers implemented and children received an assigned intervention for an entire academic year. Children were then followed longitudinally over a 3-year period. Teachers and children could only participate in one or the other cohort; in no instance were Cohort 1 teachers or children re-enrolled in the study. The present report is based on data representing all 59 teachers in Cohort 1 and 2 who were assigned to two of three study conditions and 379 children from their classrooms. Preliminary findings regarding intervention effects for the first cohort of 23 teachers and 142 children in their classrooms were described in Justice et al. (2009). The second cohort involved an additional 36 teachers and 237 children. For the present purposes, we aggregate description of Cohort 1 and Cohort 2 teachers and children.

Assignment to conditions. Using stratified random assignment by state (Ohio and Virginia, with sample size equivalent by state), teachers in each wave were assigned to (a) conduct whole-class read-alouds four times per week for 30 weeks using a print-referencing style (*high-dose print referencing*), (b) conduct whole-class read-alouds two times per week for 30 weeks using a print-referencing style (*low-dose print referencing*), or (c) conduct whole-class

read-alouds four times per week for 30 weeks as the teacher normally would (*comparison*). The present study focused exclusively on teachers who were implementing high-dose print-referencing read-alouds in relation to the comparison condition, as the parallel nature of these conditions provided a stringent test of print-referencing effects. Specifically, teachers in both of these conditions conducted 120 whole-group read-alouds over an academic year using the same storybooks in the same order according to the same schedule; however, only teachers in the high-dose print-referencing condition were requested to and trained to use a print-referencing style during reading. Questions concerning the intensity with which print referencing ought to be implemented (i.e., high- vs. low-dose conditions) are being addressed elsewhere.

Participants

The participating 59 lead classroom teachers worked in preschool programs that prioritized enrollment of children who were considered academically at risk as a function of having one or more socio-economic risk factors (e.g., family income below federal poverty levels, family stress due to unemployment, parental incarceration) or suspected or diagnosed developmental difficulties. Twenty-three of the classrooms were affiliated with Head Start programs, 19 were subsidized preK programs (supported through Title I and/or state preK dollars), five were early childhood special education programs (inclusion-based), and 12 were fee-supported independent programs that accepted vouchers. Approximately half of the classrooms were located in Ohio and the other half in Virginia. According to state census designations, the majority of classrooms were in areas that were considered urban, although 25% to 33% of the classrooms (for the regular reading comparison and high-dose print referencing, respectively) were in areas that were considered rural and/or suburban. Based on regulations regarding teacher–child ratio, the classrooms participating in this study generally enrolled 16 children and were staffed by a lead teacher and an assistant/aide. The majority of teachers reported using a commercially available curriculum within their classrooms, to include High/Scope (*n* = 38), Creative Curriculum (*n* = 18), Language Focused Curriculum (*n* = 9), and/or Step-by-Step (*n* = 1), although no empirical data were collected to document teacher use of these or any other curricula. A description of teacher characteristics appears in Table 1.

Before discussing the student sample, it is important to point out that in large-scale classroom-based research involving hierarchically structured data, as when children are nested within classrooms, the actual sampling unit is the classroom (or teacher). It is not typically necessary to assess all children within a classroom in order to be adequately powered to detect intervention effects (see Pianta, Mashburn, Downer, Hamre, & Justice, 2008). In preparation for this study, power analyses were conducted to identify the number of classrooms needed to reliably detect small effects of the intervention as well as the number of children to be drawn from each classroom. Results of these analyses indicated that a sample of 180 children per condition would be reasonable for detecting even minimal intervention effects; therefore, we sought to enroll an average of six children per classroom to arrive at this sample size.

In total, 379 children from the 59 classrooms were randomly selected to participate in ongoing assessments for this study. An average of six children (range = 2–13) were randomly selected from each classroom, with the exact number varying depending on the number of children per classroom for whom consent was received

Table 1. Teacher and child characteristics.

	n	%	M	SD	Range
Teacher characteristics	59				
Race/ethnicity					
White, non-Hispanic	38	65			
African American	15	25			
Hispanic	2	3			
Other	4	7			
Education (highest level)					
High school diploma/equivalent	12	20			
2-year college degree	17	29			
Bachelor's degree	20	34			
Graduate degree	10	17			
PreK teaching experience (in years)			10.5	9.0	0–30
Child and family characteristics	379				
Age (in months, fall of year)			51.9	4.5	41–60
Gender					
Boy	175	46			
Girl	204	54			
Race/ethnicity					
White, non-Hispanic	159	42			
African American	139	37			
Hispanic	32	8			
Multiracial or other	42	11			
Not reported	7	2			
Language spoken at home[a]					
English	333	88			
Spanish	25	7			
Not reported	37	9			
Maternal education (highest level)					
Less than high school diploma	63	17			
High school diploma/equivalent	213	56			
2-year college degree	35	9			
Bachelor's degree	20	5			
Graduate degree	4	1			
Not reported	44	12			

[a]Some caregivers reported speaking both English and Spanish at home; therefore, the percentage of responses per category exceeds 100%.

and who met eligibility criteria. Children were eligible if they were between ages 3;6 (years;months) and 4;11 on study entry (as of October 1 of the academic year), did not have an individualized education plan (IEP) for a cognitive or social/emotional disability that would impair their ability to be tested, and were able to be tested in English. Due to study selection procedures in which children were participants in targeted-enrollment preschool programs, this sample is skewed with respect to socioeconomic status (SES). Specifically, the majority of the children's families reported earning an annual income < $30,000 (56%), and only 4.5% of the families earned > $65,000 per year (data based on 83% of families reporting income data). Additional information regarding SES (maternal education), as well as other key child characteristics, is provided in Table 1.

Procedures and Random Assignment

Teachers were invited to participate in this study during information sessions presented at early childhood organizations of which the administrators had agreed to participate. Teachers who agreed to participate provided written informed consent based on approved

human subjects procedures at each participating research site. Teachers were then randomly assigned to study conditions, including the high-dose print-referencing group ($n = 31$) and the regular book-reading comparison group ($n = 28$). No statistical differences existed between the groups in terms of race/ethnicity, $\chi^2(4) = 2.74$, $p = .60$, teachers' education level, $\chi^2(7) = 2.11$, $p = .95$, or years of teaching experience, $t(57) = 1.14$, $p = .26$.

To recruit children, participating teachers sent a study information flyer and consent agreement home with every child in their classrooms who met the eligibility criteria identified previously. Interested parents returned the signed consent form to the teacher within 2-4 weeks, making their child eligible for study inclusion. From those children who were eligible, approximately six children were randomly selected per classroom to participate. In cases in which fewer than six children were eligible, random selection was preserved by selecting $k - 1$ children, with k equal to the number of eligible children. To attain the sample size dictated by a priori power estimates, oversampling occurred in those classrooms that had large numbers of eligible children. The final sample of children included 201 children (96 boys, 105 girls) in the high-dose print-referencing condition and 178 children (79 boys, 99 girls) in the book-reading comparison group. It is important to note that all children in the participating classrooms were part of the read-aloud activities; however, the children selected to participate in our study were the only children for whom direct measures of performance were obtained.

Independent t tests demonstrated no significant group differences in child age, initial language ability, average days of attendance, or family income ($ps > .2$). Pearson's chi-square tests indicated no significant differences in children's race/ethnicity by condition ($p = .06$); however, adjusted cell residuals suggested that the high-dose print-referencing group had a higher than expected representation of children who were Hispanic/Latino as compared to the book-reading comparison group.

Intervention Conditions

High-dose print referencing. The intervention implemented in this study has been described previously (see Justice et al., 2009), to which we refer readers for more complex details, including the list of storybooks read as well as specific print-related targets addressed within each book. Additionally, all intervention materials, including reproducibles, are available in Justice and Sofka (2010). Here, we provide a general overview of the intervention.

Teachers in the high-dose print-referencing group received directions and materials at the start of the academic year on how to implement a 30-week read-aloud program in their classrooms using a print-referencing style. Because much of the program would be implemented at a distance from research staff, with little to no opportunity for coaching or feedback, the directions and materials provided to teachers were explicit; these included a set of all books to be read; a schedule for reading; and a description of the scope, sequence, and frequency of print-related targets to be addressed during each read-aloud. Concerning the titles and reading schedule, teachers were provided a set of 30 commercially available children's texts in the fall of the year. The texts were carefully selected so that each contained a number of interesting print features such as font changes and character speech bubbles; the presence of such features in books is influential to how often preschool teachers will comment on print during read-alouds (Zucker, Justice, & Piasta, 2009). Teachers also

received a schedule specifying a specific title to be read during each week of the academic year (see Justice et al., 2009). In order to prevent teachers or children from having contact with the book before the week it was scheduled for use in the intervention, each book was sealed in an envelope. The reading schedule was identical for all teachers. Teachers were asked to read each week's scheduled book four times within a given week and to have no more than one read-aloud session within a day; however, the exact days of the week and the time of day at which the teacher conducted the read-alouds was left to the discretion of the teacher. Additionally, teachers were asked to conduct the read-aloud with the entire class in a whole-class session. At the end of a given week of reading, teachers were asked to place the completed book in the classroom library and to not read it again as a whole-class activity. Teachers were told that they could engage in any additional read-aloud activities that they liked, to include whole-class and small-group sessions, but that these should not include the study books.

Concerning the scope, sequence, and frequency of print-related targets to be addressed during read-alouds, a set of 15 print knowledge targets (i.e., objectives) were linked to each book that was read over the 30 weeks. All teachers in the high-dose print-referencing condition were to follow this prescribed scope and sequence of instruction for the entirety of the intervention. Specifically, each week, teachers would read a prescribed book and would address two print knowledge targets each time they read the book. Across weeks, the focus of instruction cycled across instructional targets to provide children with a balanced and varied exposure to the targets throughout the 30 weeks of the program. An insert was placed into each book that described the two targets assigned to it and gave general guidance to teachers on how to reference these targets within the content of the assigned storybook. Justice and Ezell (2004) provide illustrative examples of these references, to which we refer readers (see the Appendix for example references from the inserts). Note that the way in which teachers were directed to address these print-related targets within read-alouds was not scripted, although during professional development (discussed shortly), teachers were given general suggestions on how to use verbal (e.g., questioning about print) and nonverbal (e.g., tracking the print) references to make print a salient aspect of read-aloud sessions and to address the 15 targets. Teachers were asked to try to address each print target approximately two times in a read-aloud session.

Some professional development activities and resources were provided to teachers to support their implementation of the intervention. First, teachers in the high-dose print-referencing group attended an 8-hr workshop before the academic school year in which they were given (a) information on children's print knowledge and emergent literacy development, (b) an overview of how to read with a print-referencing style and prior findings of its efficacy, and (c) hands-on practice incorporating references to print in read-aloud sessions with workshop partners. Second, teachers received two brief feedback letters (at weeks 8 and 22) detailing strengths and areas for improvement regarding their use of a print-referencing style. This feedback letter was tailored to each individual teacher and was developed by research staff who had reviewed the designated week's videotaped book-reading session (submitted to the research team by the teacher for fidelity purposes). Third, teachers attended a 3-hr winter workshop (conducted by the research team midway through the program) to review general principles of print referencing.

Comparison. Teachers in the comparison group also conducted a whole-class book-reading session four times weekly for 30 weeks

and followed the same prescribed sequence of read-alouds using the same storybook titles as used by teachers in the high-dose print-referencing group. However, teachers in the book-reading comparison group did not receive training or information about print referencing and were instructed to simply read the books as they normally would. To ensure that teachers in the book-reading comparison group received similar levels of research-team contact and professional development, teachers in the comparison group also attended an 8-hr professional development session before the academic year, received two feedback letters from the research team on their reading practices with children (weeks 8 and 22), and attended a 3-hr winter refresher training program. The nature of these professional development activities, however, did not focus on print referencing, but instead focused on the importance of shared book-reading generally and quality book-reading practices for encouraging children's discussion of book content within and outside the book-reading context. As with teachers in the print-referencing condition, these teachers were told that they could engage in any additional read-aloud activities that they liked, but that these should not include the study books.

Fidelity to Intervention

Procedural fidelity to study conditions was measured by asking teachers in both conditions to submit videotapes of their study-related whole-class read-alouds every 2 weeks throughout the 30-week program. Overall, all 59 teachers submitted at least 8 videos, and 95% of the teachers submitted at least 10 videos. The primary approach used to assess and document procedural fidelity was to document the raw frequency with which teachers verbally referenced print using a systematic coding scheme that was developed for this purpose. Coders were blind to the conditions to which teachers were randomly assigned. Teachers' verbal print references were coded using a coding scheme to document all questions and comments referencing four print-related topics: (a) book and print organization (e.g., "Which page do I read first?"), (b) print meaning (e.g., "Who knows what this says here?"), (c) letters (e.g., "This is the letter D."), and (d) words (e.g., "These two words are exactly the same."). Any teacher utterance that contained specific key words referring to any one of these four topics was coded as a print reference; the coding system is available from the first author. Coding occurred at the utterance level, and only one code was provided to each utterance. The coding scheme and training procedures through which observers become reliable in its use are described in Zucker et al. (2009), to which we refer readers for the sake of parsimony. Reliability estimates for this tool are based on calculating the intraclass correlation coefficient (ICC) for 18 reading sessions scored by coders working independently; an ICC agreement rate of .96 for these 18 sessions indicates that this coding scheme can be used reliably.

Table 2 provides a comparison of the frequency with which teachers in the print-referencing and comparison conditions verbally referenced print for read-aloud sessions selected to represent fall (week/book 1), winter (week/book 14), and spring (week/book 30). The difference in frequency of verbal references to print between the two groups of teachers at the three time points was both statistically significant and large in size ($d = 0.96$, 1.05, and 0.99, respectively). These data indicate that children within the print-referencing classrooms were exposed to substantially more teacher references to print during read-alouds compared to children in the comparison classrooms.

Table 2. Mean frequency (*SD*) of verbal print references for teachers in two conditions.

Condition	Week/Book 1	Week/Book 14	Week/Book 30
Print referencing	23.0 (22.5)	34.7 (36.0)	37.1 (30.3)
	n = 28	*n* = 29	*n* = 27
Comparison	7.0 (6.0)	6.7 (8.1)	12.0 (18.3)
	n = 28	*n* = 28	*n* = 27
t	3.65*	4.02*	3.69*

*p < .001.

Measures

Two types of measures were used in assessing the current study's research aims: measures of children's classrooms and direct measures of child language and print knowledge ability. Classroom measures included information about the teacher and program, average SES of pupils in the classroom, and the instructional quality of each classroom. Child measures included overall language ability (expressive and receptive) and indicators of print knowledge that were taken in the fall and spring of the school year.

Classroom measures. Teacher demographic information (e.g., highest degree attained, years of teaching experience) and program affiliation information (i.e., Head Start, state-funded, or private centers) were collected through a set of questionnaires provided to teachers at the 8-hr professional development training at the beginning of the academic year.

Information regarding the average SES of pupils in each classroom was created by aggregating individual family income information for each of the participating children per classroom, collected from children's parents in the fall of the academic year through a parental questionnaire. We transformed individual income data into a classroom aggregate given that aggregate sociodemographic information is potentially more powerful as a predictor of child performance than individual information (e.g., Sirin, 2005; White, 1982).

Finally, instructional quality of classrooms was measured through direct observation using the Classroom Assessment Scoring System— Preschool Version (CLASS–PreK; Pianta, La Paro, & Hamre, 2008). CLASS–PreK is an observational instrument that assesses instructional quality based on the quality of adult–child interactions. For our purposes, classroom scores on three CLASS scales (Concept Development, Quality of Feedback, and Language Modeling) were averaged to create an instructional quality composite (see Mashburn et al., 2008). Each scale is rated on a 7-point Likert-type continuum (1, 2 = low levels of observed construct; 3, 4, 5 = moderate levels; 6, 7 = high levels).

In this study, CLASS scoring was based on 30- to 60-min observations of a range of activities and teacher–child interactions within each classroom. Classroom observations were conducted in September/October and April/May of the academic year according to a standardized protocol. Scoring of observations was conducted by CLASS-reliable coders who had previously attended a 2-day training workshop conducted by a certified CLASS master coder and had passed a reliability test (i.e., achieving 90% agreement with six gold-standard cases). Instructional quality was measured by averaging scores from the fall and spring observation points in order to establish a robust measure of the general classroom quality (see

Mashburn et al., 2008). The mean instructional quality score for classrooms in this study was in the lower average range ($M = 3.33$, $SD = 1.02$), similar to scores reported in recent studies of state-funded preK classroom quality (e.g., Mashburn et al., 2008).

Child measures. Child language ability was estimated using the composite score of the Clinical Evaluation of Language Fundamentals—Preschool: 2 (CELF–P:2; Wiig, Secord, & Semel, 2004). The composite score is derived from three subtests of the CELF–P:2 (Sentence Structure, Word Structure, and Expressive Vocabulary) that collectively measure language in the areas of vocabulary, syntax, and morphology and require approximately 15 to 20 min to administer. The Sentence Structure subtest examines children's ability to comprehend complex sentence structures. The Word Structure subtest examines children's ability to use morphological structures, including pronouns, verb tenses, noun markings, and prepositions. The Expressive Vocabulary subtest examines children's ability to name objects, actions, and people. Test–retest values for these three subtests range from .78 to .90; reported internal consistency for the subtests is .83 and .82, respectively (Wiig et al., 2004). Scores from the three subtests were summed to create the composite score, which was used as a dependent variable. CELF–P:2 scores were also used to create the dummy-coded language grouping required for relevant moderator analyses. Children were placed into language groups based on whether their composite scores indicated substantial language difficulties (i.e., children falling below the 16th percentile, or ≤ -1 SD of the mean).

Given the theoretical perspective that print knowledge is a single area of development represented by intercorrelated indicators of knowledge (see McGinty & Justice, 2009), this construct was measured as a standardized factor score based on the combination of three measures: the Preschool Word and Print Awareness Test (PWPA; Justice & Ezell, 2001; see also Justice, Bowles & Skibbe, 2006), the Phonological Awareness Literacy Screening for Preschool

(PALS–PreK) Upper-Case Alphabet Recognition subtest (Invernizzi, Sullivan, Meier, & Swank, 2004), and the PALS–PreK Name Writing subtest (Invernizzi et al., 2004). The PWPA asks children to point to or explain 14 print concepts (e.g., print directionality, meaning of environmental print) in the context of a shared reading experience. Examples of questions asked during the storybook reading include "Show me just one letter on this page," "Where do I begin to read," and "Show me where one of the ducks is talking." The PALS–PreK Upper-Case Alphabet Recognition subtest asks children to name each of the 26 individual, upper-case letters that are presented in random order on a single printed sheet. The Name Writing subtest asks children to draw and then sign a self portrait, and then their name is rated along a 7-point scale for children's symbolic understanding of print and correctness. Results of a principle axis factor analysis conducted on this study's sample demonstrated that 62% of the variance across measures was explained by the single factor used in analyses (loadings .70 to .84). Children's scores on the language assessment and print-knowledge composites appear in Table 3.

Analytic Strategy

The effectiveness of a print-referencing reading style during read-alouds on children's print knowledge was tested using hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002) with children nested in classrooms. HLM was used to partition the variance into between- and within-classroom components and to adjust significance testing for the shared classroom variance. To address the main research question, we investigated residualized gain in children's print knowledge (i.e., spring print knowledge as the dependent variable, with fall print knowledge included as a covariate; Zumbo, 1999). The analysis proceeded in several steps. First, we fit unconditional and base models for children's spring print knowledge. Base models included fall print knowledge as well as child age

Table 3. Child and classroom descriptive statistics.

| | Sample | | | | | |
Measure	All	N[a]	Print-referencing condition	N	Comparison condition	N
Language (raw score)						
Fall	38.69 (15.24)	278	40.07 (14.83)	151	37.04 (15.61)	127
Spring	48.44 (14.92)	278	49.89 (14.67)	151	46.71 (15.09)	127
Language (standard score)						
Fall	88.14 (17.03)	278	89.15 (18.52)	151	86.93 (15.04)	127
Spring	92.39 (13.93)	278	93.89 (13.91)	151	90.61 (13.81)	127
Print knowledge						
Fall	−.07 (.85)	288	−.10 (.84)	159	−.03 (.87)	129
Spring	−.04 (.85)	288	.02 (.83)	159	−.11 (.88)	129
Instructional quality	3.36 (1.01)	58	3.39 (.98)	30	3.32 (1.06)	28

Note. Language scores were derived from the Sentence Structure, Word Structure, and Expressive Vocabulary subtests of the Clinical Evaluation of Language Fundamentals—Preschool: 2 (CELF–P:2; Wiig et al., 2004), maximum = 86 (raw score) and $M = 100$, $SD = 15$ (standard score). The print knowledge standardized factor score was derived from the Preschool Word and Print Awareness Test (PWPA; Justice & Ezell, 2001) and the Upper-Case Alphabet Recognition and Name Writing subtests of the Phonological Awareness Literacy Screening for Preschool (PALS–PreK; Invernizzi, Sullivan, Meier, & Swank, 2004), based on $M = 0.00$, $SD = 1.0$. The instructional quality score was derived from the Instructional Support domain of the Classroom Assessment Scoring System—Preschool Version (CLASS–PreK; Pianta, La Paro, & Hamre, 2008), scoring range = 1,2 (low), 3–5 (moderate), 6,7 (high).

[a]Sample sizes reflect those used in analyses calculating child gain, which required both pre- and posttest scores on a given child.

and classroom instructional quality (based on the CLASS–PreK observational data), as we were interested in the effects of the intervention controlling for the latter two variables. All variables were entered as fixed effects, with continuous variables centered at their grand means. Next, we investigated the impact of teacher use of a print-referencing style by creating an intervention-status dummy variable representing this comparison (1 = high-dose print referencing; 0 = comparison) and adding the dummy variable to the HLM base model.

Our secondary research questions were addressed using similar models. The second research question mirrored the HLM analysis described above but used children's spring language scores as the dependent variable and their fall language scores as a covariate. The third and fourth research questions were analyzed by including potential child- and classroom-level moderators in the print knowledge HLM models. Independent models were estimated for each moderator of interest, including the moderator and the Moderator × Intervention Status interaction in addition to the covariates described above. When interaction terms were nonsignificant, more parsimonious models involving only main effects were examined (Cohen, Cohen, West, & Aiken, 2003). Potential moderators at the child-level included age and fall print knowledge as continuous variables and a dichotomous variable differentiating language skills above and below the 16th percentile (1 = low language skills, 0 = typically developing language skills). This cutoff corresponds to −1 SD of the mean and is a commonly applied benchmark that demarcates clinical language difficulty from typical language performance. Classroom SES, instructional quality, and teachers' years of experience were included as continuous classroom-level variables. A series of dummy codes representing Head Start, private, and state-funded preschool programs was used to investigate program type. Dummy codes were also used to represent teachers' levels of education (i.e., completion of high school, associate's, bachelor's, or graduate degree).

RESULTS

Descriptive statistics for variables included in the analyses are presented in Table 3. The ICC from the unconditional model was .210, indicating that the majority of variance in spring print knowledge was between children (79%) as opposed to between classrooms (21%). Including fall print knowledge, age, and instructional quality as covariates reduced the ICC to .143. Full model results examining the overall impact of teacher use of a print-referencing style on children's print knowledge outcomes showed that print referencing positively influenced children's gains in print knowledge, $p = .045$ (see Table 4). Controlling for age, fall score, and classroom instructional quality, children whose teachers used a print-referencing style during read-alouds out-gained those in the comparison condition by .177 points (Cohen's $d = 0.21$). The difference in adjusted spring means for children experiencing a print-referencing versus business-as-usual style of read-alouds is depicted in Figure 1.

Figure 2 provides a comparison of children's language gains across intervention and comparison conditions. As would be suggested by this figure, controlling for age, fall score, and classroom instructional quality, children's language outcomes did not differ across conditions (coefficient = .44; $SE = .96$; $p = .650$). Children in the print-referencing condition made similar gains in language ability from fall to spring as children in the comparison reading condition.

Children's age, initial (fall) literacy skills (print knowledge), and language abilities were investigated as potential moderators of

Table 4. Hierarchical linear modeling (HLM) results showing the impact of print referencing on children's print knowledge gains.

Variable	Coefficient	SE	df	p value
Spring print knowledge intercept (γ_{00})	−0.1618	0.0629	55	.013
Child-level variables				
Age in months (γ_{10})	0.0353	0.0085	285	< .001
Fall print knowledge (γ_{20})	0.6029	0.0451	285	< .001
Classroom-level variables				
Instructional quality (γ_{01})	0.1322	0.0433	55	.004
Intervention condition (γ_{02})	0.1771	0.0865	55	.045
Random effects	Variance	χ^2	df	p value
Classroom level (U_0)	0.0453	101.7749	55	< .001
Child level (R)	0.3062			

Note. Results with robust standard errors are reported.

print-referencing effectiveness. None of the child factors acted as significant moderators of the print-referencing impact, as none of the interactions between these variables and intervention status reliably predicted children's gain in print knowledge, $ps > .175$ (see Table 5). Concerning the potential moderating effects of children's language ability (which were not significant using the 16th percentile cutoff), the results remained unchanged when language status was dichotomized using a more (10th percentile) or less (25th percentile) cutoff criteria, or when language ability was included as a continuous variable, $ps > .614$. However, all child factors showed significant main effects (see Table 6). Specifically, regardless of whether they received the intervention, children who were older or who had higher print knowledge scores in the fall tended to demonstrate greater gains in print knowledge, $ps < .001$. Similarly, children with lower language abilities tended to display lower spring print knowledge regardless of study condition, $p < .001$.

Program type, instructional quality, average level of classroom SES, and teachers' levels of education and years of experience were also examined as potential moderators of the print-referencing impact. None of these variables reliably interacted with intervention status in predicting print knowledge gains, $ps > .327$ (see Table 5). Main effects for instructional quality and classroom SES were significant, $p = .005$ and $p = .010$, respectively (see Table 6). Irrespective of study condition, children enrolled in higher quality classrooms or classrooms with higher aggregated pupil SES demonstrated greater gains in print knowledge during the academic year. However, teacher education, teacher experience, and program type were unrelated to children's print knowledge gains, $ps > .144$.

DISCUSSION

Contributions and Overview of Key Findings

The most immediate contribution of this study is in its demonstration that preschool teachers can make very modest adjustments in

Figure 1. Spring print-knowledge means for children in the intervention and comparison conditions, adjusted for age, fall score, and classroom instructional quality.
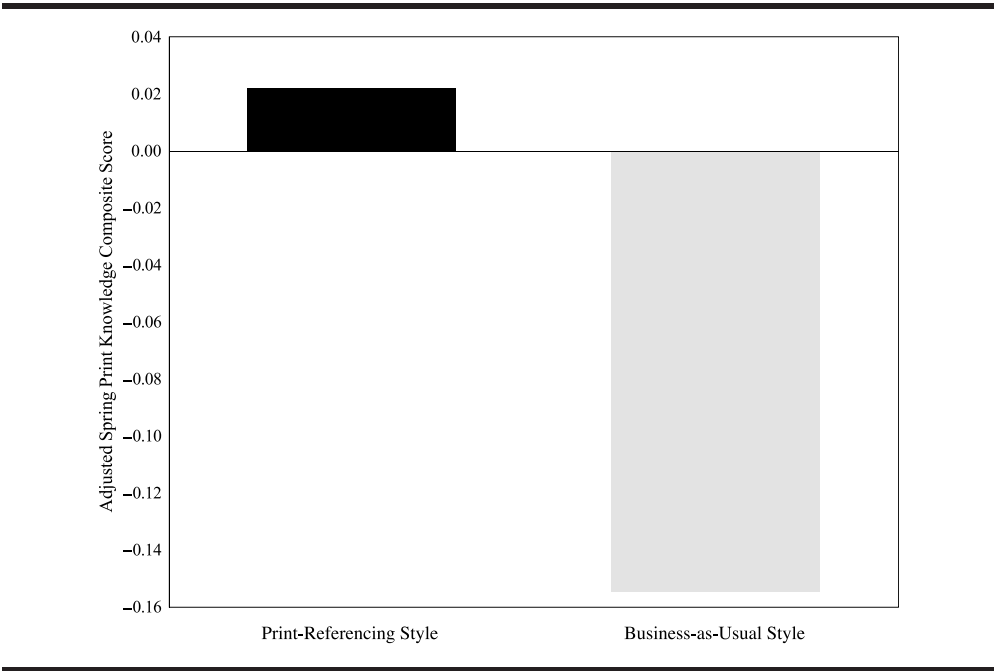
the way they read books with children to increase 4- and 5-year-old children's knowledge about print. More specifically, the results of this study indicated that preschool teachers who embedded explicit references to print during regular whole-class read-alouds significantly increased children's print knowledge compared to teachers who did not. Although ours is not the first experimental study to show that adults can adjust the way they share books with children to afford them developmental benefits (e.g., Dale, Crain-Thoreson, Notari-Syverson, & Cole, 1996; Hargrave & Sénéchal, 2000; Justice & Ezell, 2000, 2002; Lonigan et al., 1999; Lonigan & Whitehurst,

Figure 2. Spring language means for children in the intervention and comparison conditions, adjusted for age, fall score, and classroom instructional quality.
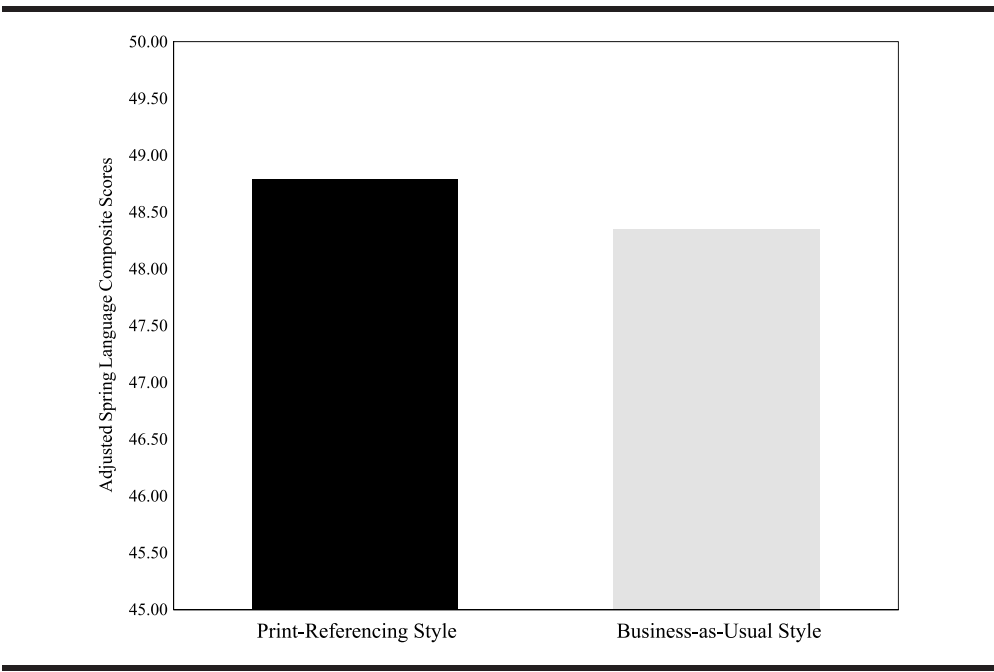
Table 5. HLM results for moderator analyses: Variable × Intervention Status interactions.

Variable	Coefficient	SE	df	p
Interactions involving child-level variables				
Age in Months × Intervention Status	−0.0089	0.0151	284	.558
Fall Print Knowledge × Intervention Status	−0.1090	0.0801	284	.175
Low Language × Intervention Status	−0.1044	0.1602	276	.515
Interactions involving classroom-level variables				
Instructional Quality × Intervention Status	−0.0825	0.0851	54	.337
Classroom SES × Intervention Status	−0.0031	0.0336	53	.927
Years of Experience × Intervention Status	0.0062	0.0098	52	.533
Program type with private preschool as reference[a]				
State-funded Preschool × Intervention Status	−0.1974	0.2076	50	.347
Head Start Preschool × Intervention Status	−0.1757	0.1775	50	.327
Teacher level of education with high school degree as reference group[a]				
Associate's Degree × Intervention Status	−0.1208	0.1820	48	.510
Bachelor's Degree × Intervention Status	−0.1349	0.2274	48	.555
Graduate Degree × Intervention Status	0.0655	0.2311	48	.778

Note. Results with robust standard errors are reported. All variables were entered into independent models, with the exception of dummy-coded variables representing a single factor. All models included child age, fall print knowledge, and instructional quality as covariates, as well as the main effect of the moderator of interest and treatment condition. Complete results for each model are available from the third author upon request.

[a]Factor was represented by multiple dummy-coded variables; results were similar regardless of the reference group used.

1998; McNeil & Fowler, 1999; van Kleeck et al., 2006; Whitehurst et al., 1988, 1994), ours is among relatively few that have done so through the lens of an effectiveness study and, by consequence, address the potential scalability of shared reading interventions. Although there are a range of possible practices for increasing young children's emergent literacy skills, those that are most "robust" with respect to potential scalability have a persuasive research base that shows not only causal impacts of the intervention but also that it can produce benefits under everyday conditions (McCall, 2009).

Table 6. HLM results for moderator analyses: Main effects.

Variable	Coefficient	SE	df	p
Child-level variables				
Age in months	0.0356	0.0085	286	< .001
Fall print knowledge	0.5999	0.0462	286	< .001
Low language	−0.3676	0.0876	277	< .001
Classroom-level variables				
Instructional quality	0.1323	0.0448	57	.005
Classroom SES	0.0392	0.0147	54	.010
Years of experience	−0.0008	0.0051	54	.870
Program type[a]				
State-funded versus private preschool	0.0311	0.1344	53	.818
Head Start versus private preschool	0.0060	0.0967	53	.951
State-funded versus Head Start preschool	0.0251	0.1169	53	.831
Teacher level of education[a]				
Associate's versus high school degree	0.1379	0.0931	52	.144
Bachelor's versus high school degree	0.0898	0.1262	52	.480
Graduate versus high school degree	−0.0205	0.1348	52	.880
Bachelor's versus associate's degree	−0.0481	0.1241	52	.699
Graduate versus associate's degree	−0.1584	0.1295	52	.227
Graduate versus bachelor's degree	−0.1103	0.1360	52	.421

Note. Results with robust standard errors are reported. All variables were entered into independent models, with the exception of dummy-coded variables representing a single factor. All models included child age, fall print knowledge, and instructional quality as covariates, as well as the main effect of the treatment condition. Complete results for each model are available from the third author upon request.

[a]Main effects for these factors represented contrasts among multiple dummy-coded variables.

The findings of this research study, by linking child gains in print knowledge to adjustments in teachers' reading style, make a salient contribution to current directions in early childhood education theory, research, and practice, which increasingly emphasize the importance of explicitly supporting those pre-academic competencies that are directly related to later reading success within the early childhood classroom. However, the present study also reflects an increasing trend in educational sciences to ensure that impacts seen in smaller scale efficacy studies hold when practices are employed in business-as-usual settings by community professionals (e.g., Barnett et al., 2008; Bierman et al., 2008). Put another way, although efficacy studies are important to guiding educational practices and policies, effectiveness studies are necessary for determining whether efficacious practices are scalable into a broad range of implementation settings and for identifying the magnitude of effects that can be expected.

Considering first the theoretical contributions of this work, the present findings contribute to recent discussions describing how young children develop their knowledge about print within mediated experiences with print at home and at school (e.g., Evans et al., 2008; Sénéchal, 2006; Sénéchal et al., 2001; Whitehurst & Lonigan, 1998). Some of these discussions have centered on how best to differentiate the various skills (referred to variously as processes, domains, components, strands, and the like; see Sénéchal et al., 2001) that are represented by the emergent literacy construct, and to better represent the kinds of experiences that support these various skills. For instance, on the basis of longitudinal, correlational evidence, Sénéchal and colleagues (2001) have suggested that explicit teaching supports children's growth in code-based skills, such as print knowledge, whereas meaning-focused experiences support children's language skills, such as vocabulary. Findings from our study, which are experimental in nature, help to support the importance of explicit teaching, even when situated within a highly contextualized activity, to children's achievements of certain emergent literacy skills, including print knowledge, but not others (e.g., oral language; see Aram & Levin, 2002; Whitehurst & Lonigan, 1998). That specific experiences appear to be closely aligned to specific skills helps to explain why children whose early childhood experiences offer only limited exposure to print within their homes, schools, and communities have relatively little knowledge about print compared to children with unrestricted exposure (e.g., Neuman, 1999; Neuman & Celano, 2001).

Concerning book-reading experiences in particular, developmental theories are important for describing the specific types of read-aloud experiences that seem most influential to young children's development of print knowledge (Mason & Stewart, 1990). Although exposure to read-alouds in the home and other caregiving environments is important to children's development, its influence seems largely constrained to affecting oral language skills (e.g., vocabulary, grammar; see Aram & Levin, 2002; Sénéchal et al., 2001) *unless* adults reading with children explicitly mediate their interactions with the written code within the book to increase their direct contact with print (Snow, 1983). The role of adult mediation may, in fact, be *necessary* for increasing children's direct contact with print during read-aloud experiences. In a recent experiment, Justice and colleagues (2008) found that in a typical picture-focused read-aloud session, 4-year-old children fixated on print within the book about 10 times, compared to about 20 times during print-focused read-alouds in which an adult reader talked about print and pointed to print in the book while reading. If we extrapolate these data to the experiences of

children in the present study, children in classrooms within which teachers used a print-referencing style would have fixated on print 1,000 times more than children in the book-reading comparison classrooms over the course of 120 classroom-based read-alouds. These differences appear to have consequences for the rate with which children internalize knowledge about print, as shown in the present study. Importantly, study findings show that despite the increased focus on print inherent to the book-reading experiences of children in the print-referencing condition, this did not appear to have any adverse effect on language development; indeed, language gains were similar irrespective of the book-reading conditions to which children were assigned.

Practical Implications

The results of this work show that early childhood professionals can make modest adjustments to the way they read books with children to bring about measurable improvements in children's knowledge about print. SLPs can use their knowledge of effective practices, including the one described here, to support early childhood educators' delivery of prevention-oriented classroom-based interventions that can promote children's achievements in areas that have been linked positively to later reading and academic success. In fact, given that intervention effects are not moderated by children's language status (whereby the intervention does not differentially benefit children with low vs. high language skills) and do not seem to detract from any language benefits children may derive from shared reading experiences, SLPs may wish to specifically endorse the use of this reading style in their collaborative interactions with early childhood educators. In so doing, SLPs can support educators' efforts to perform within the context of broadening standards-based educational reforms, including the increasing emphasis on supporting children's print-knowledge development within early childhood settings.

The prominence of print knowledge within preschool learning standards, including those of Head Start, is largely based on the predictive associations between the extent to which children display knowledge about print during early childhood and their later accomplishments in reading, particularly word recognition (see Storch & Whitehurst, 2002). Use of a print-referencing style when reading low-cost, commercially available trade books in whole-class settings seems a particularly viable alternative to more extensive intervention approaches that require specialized materials or curricula coupled with intensive, ongoing professional development for teachers (e.g., Assel, Landry, Swank, & Gunnewig, 2007; DeBaryshe & Gorecki, 2007; Fischel et al., 2007; Pianta et al., 2008). For the sake of comparison, *Let's Begin With the Letter People* (Abrams & Company, 2000) and *Doors to Discovery* (Wright Group, McGraw-Hill, 2001) are two examples of commercially available curricula designed to foster young children's print knowledge that have been empirically studied (Assel et al., 2007). Although impacts on children's print knowledge ($d = 0.28$) are similar to those we see with use of a print-referencing style, implementation costs for use of either curricula are exponentially higher than reading trade storybooks with a print-referencing style. Consequently, SLPs may find this intervention particularly easy to take to scale in those early childhood programs with which they are affiliated.

An important topic to consider with respect to the practical implications of this experiment concerns the magnitude of the effects observed in this study. Typically, effects seen in larger scale

effectiveness field studies are attenuated relative to more tightly controlled efficacy trials (Robey, 2004). This was the case for the present research with respect to observed child outcomes, in which impacts were more modest than in previous reports. For instance, data presented in Justice and Ezell (2002) for 30 children enrolled in Head Start who received an 8-week (24 session) read-aloud program indicated a large effect-size contrast ($d = 1.1$) on a print awareness composite for children who received a print-referencing style of reading compared to children who received a picture-focused style of reading. Additionally, in the initial report of this RCT, which presented findings for the first cohort of teachers and children, effect-size estimates ranged from 0.42 to 0.56 for three measures of print knowledge (Justice et al., 2009).

Comparatively, the results of the present work show that benefits attributable to the print-referencing style are likely to be more modest in size, consistent with a small effect-size contrast ($d = 0.21$), when this intervention is implemented in authentic practice settings characterized by a great deal of multilevel heterogeneity (in terms of settings, teachers, children). This attenuation of effects relative to the preliminary report based on an initial cohort of 23 teachers and a more restricted range of settings was to be expected. For instance, the educational level of the 59 teachers described in the present report exhibits a greater spread than was seen in the preliminary report, with fewer teachers in the full sample having completed a university degree (e.g., 51% of teachers in the full sample compared to 78% in the preliminary sample). Perhaps relatedly, fidelity of implementation of print referencing (see Table 2) for the full sample appears slightly attenuated compared to that for the preliminary sample (e.g., at the fall observation, teachers in the preliminary sample used an average of 28 verbal print references compared to 23 for the full sample). Nonetheless, it is important to note that the effect-size estimate reported here fits solidly within the 95% confidence intervals for all three outcomes found with the initial cohort of this RCT (0.10 to 0.88 for print-concept knowledge, 0.16 to 0.95 for alphabet knowledge, and 0.02 to 0.80 for name-writing ability).

The attenuation of effects seen in effectiveness studies relative to efficacy trials is generally attributable to the lessening of controls over internal validity (e.g., using teachers vs. research staff to implement an intervention, implementing the intervention in authentic vs. highly controlled settings) as a trade-off for the increased attention toward generalizability (external validity) characteristic of effectiveness studies (Robey, 2004). Despite the attenuation of effects observed in this study of print referencing compared to prior efficacy work (Justice & Ezell, 2000, 2002), it is useful to consider the magnitude of effects reported here in relation to other interventions implemented with the target population in research of similar scale (Hill, Bloom, Black, & Lipsey, 2007); to do so, we look to three recently published effectiveness studies for purposes of comparison, all involving samples quite similar to those in the present study.

Fischel and colleagues (2007) studied child outcomes attributable to a commercially available, comprehensive, teacher-directed literacy curriculum (*Let's Begin with the Letter People,* Abrams & Company, 2000) in 12 classrooms affiliated with a single Head Start program in New York state; children in 11 classrooms served as a comparison group and received business-as-usual instruction. This curriculum is comprehensive in that its activities span the entire classroom day (e.g., meeting circle, interest centers, take-home activities), and it involves major modifications to the classroom schedule and organization. Effect-size contrasts on three measures of print knowledge (book knowledge, print conventions, alphabet knowledge)

ranged from 0.37 to 0.39, which are considered small based on conventional benchmarks (Hill et al., 2007). Bierman et al. (2008) and Barnett et al. (2008) reported slightly more modest effect-size contrasts in recent effectiveness studies of the Head Start REDI intervention and the *Tools of the Mind* (Tools; Bodrova & Leong, 2007) curriculum, respectively. The Head Start REDI intervention is a multifaceted program coupling a socioemotional learning program with interactive book reading, phonological awareness games, and alphabet centers (Bierman et al., 2008). The intervention was implemented in 22 Head Start classrooms located in Pennsylvania. The effect-size contrast on a measure of print awareness for children in the REDI classroom compared to children in 22 comparison classrooms was small in size (0.16). Effect sizes for children's socioemotional outcomes were slightly larger yet still small in size (0.21–0.23). The Tools curriculum involves teacher implementation of a large number of Vygotsky-inspired, dramatic, play-based activities designed to support children's cognitive development; these are coupled with regular "buddy reading" (children read to one another) and scaffolded writing activities (e.g., teachers help children write dramatic play plans; Barnett et al., 2008). Teachers of seven classrooms in one center serving primarily disadvantaged children implemented the curriculum; teachers in 11 classrooms in the same building served as comparisons. The effect size on a measure of children's knowledge of printed letters and words indicated no advantage of the Tools curriculum relative to the comparison (−0.10), and effect sizes for related areas of development were small in size (e.g., 0.11–0.22 for expressive and receptive vocabulary, respectively).

These comparisons, drawn from recent effectiveness studies involving samples similar to those involved in the present study of print referencing, are helpful for contextualizing the present findings. Collectively, these three effectiveness trials show that teacher-implemented, classroom-based interventions delivered with preschoolers exhibiting risk tend to exhibit effect sizes that are small in size on measures that are closely aligned to the interventions. That the effect-size estimate ($d = 0.21$) observed in this study was affiliated with only modest adjustments to the way teachers read books with children and required only a set of 30 trade storybooks is of note.

As a final point of discussion, we must comment on our failure to identify any significant moderators influencing the relation between the intervention and child outcomes in print knowledge. The scope of this study, which involved more teachers and children than any prior study of a read-aloud intervention of which we are aware (for points of reference, see Dale et al., 1996; Hargrave & Sénéchal, 2000; Justice & Ezell, 2000, 2002; Lonigan et al., 1999; Lonigan & Whitehurst, 1998; McNeill & Fowler, 1999; van Kleeck et al., 2006; Whitehurst et al., 1988, 1994), allowed us to look closely at whether the positive impacts of this intervention seemed to be affected by characteristics of children, intervention implementers (teachers), or settings. McDonald and colleagues (2006) contended that one of the more salient features of scale-up effectiveness studies is, in fact, their size, as this allows one to determine whether an exemplary intervention can produce net positive effects when increased numbers of children are exposed to the intervention in increasingly variable intervention contexts. Indeed, a hallmark characteristic of a "robust" intervention is that its effects can hold over a variety of conditions and are not moderated by contextual variations (McCall, 2009). That we found no pertinent moderating effects of child-, teacher-, and setting-level characteristics suggests that teacher use

of a print-referencing style of reading is not unduly influenced by individual differences among children, teachers, or classrooms.

Limitations and Future Research Directions

Several limitations warrant discussion. A major limitation of this study is that we cannot yet present outcomes for children beyond the year in which they received intervention. Although we have suggested that the intervention effects presented here are reasonable in relation to other studies of a similar sort, and that print knowledge is an important aspect of development given its relation to children's long-term reading outcomes, we must also point out that it is unclear whether intervention that increases children's print knowledge in the short-term offers any long-term developmental advantage. Because children in this study are being followed longitudinally for an additional 2 years following intervention, future reports will shed light on this issue.

A second limitation is that teachers self-selected into this study; thus, the 59 teachers enrolled in this study may differ in important ways from teachers who would not select into a study of this kind. Because teachers knew before consenting that they would be required to implement a reading program within their classrooms, it is possible that teachers who opted out were less comfortable with or interested in reading books within their classrooms because they do not read well themselves. The extent to which the findings reported here would be replicated in other settings with other groups of teachers is important for understanding whether a print-referencing reading style can truly be taken to scale in early childhood settings.

The final limitation of note is that the majority of children in this study spoke English in the home environment, largely due to the geographic locations of the study. Children who are learning English as a second language comprise a large and growing number of those pupils participating in center-based preschool programs, yet it is unclear whether the findings presented in this report would generalize to youngsters who have less facility with the English language. Thus, although we characterized this work as an effectiveness study, we are cautious in generalizing its findings to settings that vary substantially from those in which the study took place, particularly settings that serve large numbers of English language learners.

Beyond these limitations, this study also points toward some appealing future lines of research. As is clear from numerous research studies featuring correlational, quasi-experimental, and experimental methodologies, to include effectiveness research of the kind reported here, we can reasonably expect book-reading interventions to have positive impacts on young children's language and literacy development. Yet, a variety of questions remain, and these have practical import as we consider how best to design and implement interventions that have developmental benefits for children, particularly those who are at risk for future literacy problems. For instance, in this work, the counterfactual of interest was business-as-usual whole-class book reading within classrooms using the same reading schedule and texts as occurred in treatment classrooms. A natural next step in this progression of research involves contrasting use of a print-referencing style with other empirically validated reading interventions, such as dialogic reading (Whitehurst et al., 1988), on a broad range of important child outcomes, encompassing both literacy and language. At the same time, a compelling future study might involve coupling print referencing with dialogic reading or other interactive reading approaches. Additionally, particularly important in all such future forays is careful assessment of questions of moderation if we are to go beyond knowing "what works." For instance, given SLPs' special interest in children with disabilities, it is necessary to explicitly determine whether shared-reading interventions that are efficacious and/or effective for a general population of children have generalizable effects, as this is not always the case (e.g., see Crain-Thoreson & Dale, 1999, which failed to show positive impacts of dialogic reading on the language growth of children with language disorders). Also, examination of specific child by treatment characteristics is necessary for fully integrating developmental and intervention research that differentiates intervention foci and techniques on the basis of important child attributes (e.g., initial skill levels, temperament, attention; see Bierman et al., 2008; McGinty & Justice, 2009).

To sum, this effectiveness study showed that teachers can make subtle adjustments to the way they share books with children to bolster the knowledge children possess about print. More broadly, the results of this study also point to the importance of exploring how children's pre-academic competencies, including emergent literacy, can be developed by simply enriching those practices that are already in use within the preschool classroom. Indeed, the findings of this work, with respect to effect-size estimates attributable to the intervention, are comparable to those seen in other recent effectiveness studies involving more intensive and extensive modifications to classroom activities and teachers' practices (e.g., Barnett et al., 2008; Fischel et al., 2007). As we consider how to build capacity within the early education field so that it might better achieve its goals of helping more children enter school ready to learn, we must explore practices that can be readily adopted by large numbers of educators to be used at scale.

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Contact author: Laura Justice, College of Education and Human Ecology, The Ohio State University, 231 Arps Hall, 1945 N. High Street, Columbus, OH 43210. E-mail: justice.57@osu.edu.

APPENDIX. SAMPLE PRINT REFERENCES FROM STUDY BOOK INSERTS

Target	Sample reference
Environmental print	We see words and letters at the bottom of this page. Who can show me where we see words and letters somewhere else?
Author of book	What does an author do? Remember, we talked about the difference between an author and an illustrator. The illustrator draws the pictures, so what must the author do?
Upper- and lower-case letters	Which one is an upper-case letter? This one (points to an upper-case *D*) or this one (points to a lower-case *c*)?
Title of book	Who can show me the title of this book? Patrick, you'll know this, because you've read this book many times, and we've talked about it together.