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Full-day kindergarten and children's later reading: The role of early word reading

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ABSTRACT

Full-day kindergarten is one means to improve the academic skills of children, particularly those at risk for academic difficulties. Full-day children generally earn higher end-of-kindergarten reading scores than those in half-day. Unfortunately, the benefit of full-day programs fades shortly after kindergarten. Research, however, has not considered whether the specific reading skills children attain in kindergarten help sustain the full-day kindergarten benefit. This study examined full- and half-day kindergarten children's early word reading attainment (composite of letter knowledge, beginning sounds, ending sounds, and sight words) and its association with reading in elementary school. Full-day children were more likely to attain early word reading by the end of kindergarten which, in turn, predicted higher reading scores in first, third, and fifth grades. Early word reading attainment was associated with decreased SES–related reading gaps in elementary school.

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Far too many children in the United States, particularly those from low income, racial/ethnic minority, or non-native English speaking backgrounds, go through school lacking the necessary reading skills to be successful in later life (Lesaux, 2012; Reardon & Galindo, 2009; Reardon, Valentino, & Shores, 2012). According to the National Assessment of Educational Progress (National Center for Education Statistics, 2013), 32% of 4th graders and 22% of 8th graders scored below basic reading levels in 2013. Black and Hispanic[1] children generally score lower in reading than White and Asian children, and children from low SES backgrounds score lower than those from middle/high SES backgrounds (Reardon et al., 2012). These group-related differences are evident at the start of kindergarten (Arnold & Doctoroff, 2003; Snow, Burns, & Griffin, 1998; Waldfogel, 2012) and tend to increase over time (Reardon et al., 2012; Snow et al., 1998). Thus, researchers and educators have stressed the importance of addressing children's foundational reading skills during preschool and the start of formal schooling (e.g., Neuman, 2006; Snow et al., 1998) to decrease group-related differences and improve later reading skills.

Full-day kindergarten is one means educators have used to attempt to improve the early reading skills of children, especially those considered at risk for academic difficulties (DeCicca, 2007; Lee, Burkam, Ready, Honigman, & Meisels, 2006). As of 2013, 77% of kindergarten-aged children were enrolled in full-day kindergarten programs (Child Trends Data Bank, 2015). School districts generally have targeted low-income and racial/ethnic minority children for enrollment in full-day programs; thus, children who are low-income, Black, or English Language Learners (ELL) have been more likely than other children to attend full-day kindergarten programs (Lee et al., 2006; Walston & West, 2004). Although studies consistently find higher achievement of full-day kindergarten children relative to half-day counterparts, it is unclear whether the benefits extend beyond kindergarten and, if so, for how long (e.g., DeCicca, 2007).

Research on full-day kindergarten has focused primarily on children's overall reading performance during the kindergarten year (Walston & West, 2004; Zvoch, Reynolds, & Parker, 2008). However, this research does not typically address the reading skills that children acquire during kindergarten, particularly as it relates to full-and half-day students' later reading (Cannon, Jacknowitz, & Painter, 2006; Votruba-Drzal, Li-Grining, & Maldonado-Carreño, 2008). Documenting the reading skills learned in kindergarten is pertinent for understanding children's subsequent reading development. Is attaining certain foundational reading-related skills associated with decoding and word recognition in kindergarten positively related to full-day attendance? And, if so, is attainment of these foundational reading skills during kindergarten associated with subsequent reading skills in elementary school? The present study focuses on the reading skills that full- and half-day children acquire during kindergarten and their association with reading performance in the elementary grades. Data come from the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K), a nationally representative dataset (Tourangeau et al., 2009). Our review begins with a brief history of kindergarten in the United States followed by a review of skills pertinent to children's reading development. Finally, we discuss the relation between full-day kindergarten and children's reading development.

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[1] The term Hispanic is used rather than Latino to be consistent with ECLS-K and U.S. Census designations.

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The importance of kindergarten

The role kindergarten should play in children's education has been debated for almost two hundred years (Lee et al., 2006; Zvoch et al., 2008). A commonly debated issue is the extent to which kindergarten programs should focus on social/emotional and/or academic development (Cannon et al., 2006). Another issue is whether all children or only those considered at risk for academic difficulty should attend full-day kindergarten.

Kindergarten in the U.S. began as an opportunity for children to develop social skills (Lee et al., 2006). The original programs were full-day but were changed to half-day during World War II due to teacher shortages. Since the 1970s, there has been an increasing emphasis on fostering children's academic development during kindergarten. This, of course, leads to questions of what kind of instruction, and how much (full vs. half-day kindergarten) is optimal for children's learning? Are the benefits of instruction equally optimal for all children?

Although there has been extensive research on the effects of kindergarten (see Lee et al., 2006; Votruba-Drzal et al., 2008 for reviews), we still lack sufficient evidence to fully determine whether there is a long lasting academic benefit for full-day kindergarten and, if so, whether it varies across demographic groups (Lee et al., 2006). Nevertheless, educational jurisdictions are increasingly adopting full-day kindergarten programs (Cannon et al., 2006; Clark & Kirk, 2000; Votruba-Drzal et al., 2008). The percentage of children enrolled in full-day kindergarten increased from 28% in 1977 to 77% in 2013 (Child Trends Data Bank, 2015). In 2012, eighty-three percent of children in the South and 80% in the Midwest were enrolled in full-day kindergarten compared to 71% in the Northeast and 63% in the West. Differences in enrollment in full-day programs as a function of demographic background (parents' education, race/ethnicity) have decreased (Child Trends Data Bank, 2015). Given that so many jurisdictions now implement full-day kindergarten, a clearer understanding about its effectiveness is needed.

With an increasing focus on academic development in recent years, much of the research on the effectiveness of full-day kindergarten programs has focused on children's reading development (Lee et al., 2006; Votruba-Drzal et al., 2008; Zvoch et al., 2008). Understanding the nature of early reading skills and how they develop over time will lend insight into the long-term reading achievement of full-and half-day kindergartners.

Children's reading development

Learning to read requires mastery of a range of skills including oral language, decoding and word recognition, and vocabulary and conceptual knowledge (Ehri & Roberts, 2006; NICHD-ECCRN, 2005a; Snow et al., 1998; Whitehurst & Lonigan, 2001). Research on reading has shown the importance of letter knowledge, phonological awareness, and print knowledge for subsequent decoding and word recognition skills (Adams, 1990; Hulme, Bowyer-Crane, Carroll, Duff, & Snowling, 2012; Kaplan & Walpole, 2005; Morris, Bloodgood, & Perney, 2003; National Early Literacy Panel, 2008; National Reading Panel, 2000; Shapiro, Carroll, & Solity, 2013; Snow et al., 1998; Stanovich, 1986).

Although learning to read requires more than just acquisition of decoding-related skills (Snow et al., 1998), reading difficulties in early elementary school often can be traced back to difficulties acquiring these early reading-related skills (Hulme et al., 2012; Juel, 1988; Serpell, Baker, & Sonnenschein, 2005; Snow et al., 1998). Thus, Snow et al. (1998), in their seminal book, as well as others, have stressed the importance of children in kindergarten developing letter knowledge and phonological awareness (see also Duke & Block, 2012), key components of early word reading that are foundational for subsequent reading development.

Mastering early reading-related skills by the end of kindergarten or start of first grade predicts later word recognition and, in turn, reading comprehension (Betts et al., 2008; Kaplan & Walpole, 2005; Morris et al., 2003; Scanlon & Vellutino, 1996). For example, Storch and Whitehurst (2002), studying low-income children, showed the relation between what they called code skills (letter knowledge, phonological awareness; Whitehurst & Lonigan, 2001) in preschool and kindergarten, and subsequent reading development (including reading comprehension) in elementary school. Phillips and Torgesen (2006) reviewed research showing the relation between phonological awareness during preschool and kindergarten and later reading fluency (see also Ding, Richardson, & Schnell, 2013; Ehri & Roberts, 2006). Kaplan and Walpole (2005) found that low-income kindergarteners who were proficient in letter knowledge and phonological awareness skills and moderately proficient in recognizing simple words had comparable achievement to higher-income peers in first grade.

Given the importance of each of these early reading skills, it is particularly useful to document whether children are attaining this set of skills, or what can be considered “early word reading skills” (a combination of letter knowledge, phonological skills and some simple sight words), in kindergarten. The focus in this study was children's attainment of early word reading in kindergarten and their subsequent reading development and, in particular, differences between children in full- and half-day programs.

Full-day kindergarten and children's reading development

The majority of studies on the benefits of full-day kindergarten find that children in full-day programs earn significantly higher reading scores at the end of kindergarten than those in half-day programs (Baskett, Bryant, White, & Rhoads, 2005; Gullo, 2000; Lee et al., 2006; Votruba-Drzal et al., 2008; Walston & West, 2004; Walston, West, & Rathbun, 2005; Yan & Lin, 2005; Zvoch et al., 2008). Unfortunately, however, the initial benefits for children attending full day-kindergarten do not continue through elementary school and only last, at most, through first or second grade (Gullo, 2000; Saam & Nowak, 2005; Votruba-Drzal et al., 2008; Walston et al., 2005; Wolgemuth, Cobb, & Winokur, 2006).

A meta-analysis of 655 studies comparing full-day to half-day kindergarten found that children in full-day kindergarten earned early reading scores at the end of kindergarten that were approximately one-quarter of a standard deviation above other children, even after controlling for race/ethnicity and income (Cooper, Batts Allen, Pattall, & Dent, 2010). Full-day kindergarten is beneficial even after accounting for language spoken at home, poverty status, parental education, and family structure (Cooper et al., 2010; Walston et al., 2005). Furthermore, the benefits of full-day kindergarten are apparent even though children in full-day programs start kindergarten significantly behind their half-day counterparts in terms of reading performance (Hall-Kenyon, Bingham, & Korth, 2009; Zvoch et al., 2008). Thus, not only do children in full-day programs earn significantly higher reading scores at the end of kindergarten than children in half-day programs, they also make greater gains over the course of the school year.

Some researchers have found the initial benefits of full-day kindergarten are particularly promising for children from academically at-risk groups, including Black, Hispanic, and ELL children, and children whose parents have low educational attainment and/or are low income (Walston et al., 2005; Yan & Lin, 2005). Hall-Kenyon et al. (2009) found that ELL children in full-day kindergarten had greater gains in oral language than their non-ELL peers, as well as their ELL and non-ELL peers in half-day programs. Furthermore, Walston et al. (2005) found that there was less of a difference in growth rate between ELL and native English speakers in full-day than half-day programs when examining children's trajectories from kindergarten through the elementary grades. Black and Hispanic, and lower-income full-day students generally have significantly higher achievement than their half-day counterparts, according to district, state, and national data (Education Commission of the States, 2005). Other researchers, however, find no differential benefit of full-day kindergarten, with all children benefitting from full-day programs regardless of demographic characteristics (Cannon et al., 2006;

Lee et al., 2006; Zvoch et al., 2008). Thus, overall findings regarding the enhanced benefit of full-day kindergarten for different groups of children are inconsistent.

In addition, initial academic benefits of attending full day-kindergarten are generally not sustained through elementary school (Gullo, 2000; Saam & Nowak, 2005; Votruba-Drzal et al., 2008; Walston et al., 2005; Wolgemuth et al., 2006). Researchers have speculated reasons for the fade-out, including the characteristics of children who attend full-day programs, the quality of instruction and support in school environments post-kindergarten, and summer learning loss (Hahn et al., 2014; Zvoch, 2009). Children who are at an increased likelihood of academic difficulty are more likely to attend full-day kindergarten (Lee et al., 2006; Walston & West, 2004), so it is plausible that, although full-day kindergarten has initial benefits, children's experiences post-kindergarten (e.g., lack of continued intervention, less individualized support) do not sustain the learning from kindergarten (Rothstein, 2013; Welner & Carter, 2013). Zvoch (2009) examined summer learning loss of full- and half-day children and found that full-day children's phoneme skills decreased substantially relative to half-day counterparts, highlighting the need to consider skills acquired during kindergarten and their relation to later reading performance.

Research on the benefits of attending full-day kindergarten generally has focused on overall reading scores without considering which reading skills are acquired (Cannon et al., 2006; Rathbun & West, 2004). Although some researchers like Hall-Kenyon et al. (2009) have considered the specific skills attained by the end of kindergarten (e.g., rhyming, alphabet knowledge), it is unclear whether there is a benchmark skill or set of skills necessary to show continued benefit of full-day kindergarten in subsequent years. Although skill attainment has not been studied in relation to the long-term benefit of full-day kindergarten attendance, it has been the focus of research on income related differences in children's reading.

Kaplan and Walpole (2005) examined income-related differences using ECLS-K reading proficiency probability scores (ranging from 0 to 1) to examine the set of early reading skills with which children enter first grade and their subsequent acquisition of more advanced skill sets. They identified five skill sets representing varying levels of competencies in letter knowledge, beginning sounds, ending sounds, and sight words, where each skill set became increasingly advanced. The skill set most advantageous for children from low-income families was what they called early word reading. It consisted of high probability of proficiency in letter knowledge, beginning sounds, and ending sounds, and low or moderate probability of proficiency in sight words. Acquisition of early word reading by the start of first grade eliminated the income related gap in children's reading skills, thereby buffering the negative effects associated with poverty.

The present study extended Kaplan and Walpole's (2005) findings on early word reading to the effects of full-day kindergarten attendance on children's reading skills. Early word reading skills provide information on the degree to which children acquire a set of important early reading skills by the end of kindergarten, rather than focusing on a global reading score or an average of performance across skills, which fail to provide information on where children stand on each skill. And, as previously noted, the components of early word reading are considered critical for subsequent reading development (Snow et al., 1998; Storch & Whitehurst, 2002).

Two overarching aims addressed the role that reading skills acquired in kindergarten play in later reading achievement. Aim one addressed the attainment of early word reading skills in kindergarten, particularly for low-SES, Black and Hispanic children, and ELL. Given prior research demonstrating the benefits of full-day kindergarten during the kindergarten year (e.g., Baskett et al., 2005; Zvoch, 2009; Zvoch et al., 2008), it was hypothesized that children in full-day programs would be more likely to attain early word reading skills (letter knowledge, phonological awareness, and sight words) by the end of kindergarten than children in half-day programs. The focus on early word reading reflects what theorists and researchers view as a necessary foundation for subsequent reading development (e.g., Ehri & Roberts, 2006; Storch & Whitehurst, 2002). It also is consistent with recommendations by the Common Core of State Standards for the reading skills that children should have mastered by the end of kindergarten (National Governors Association Center for Best Practices, & Council of Chief State School Officers, 2010).

Of particular interest in this study was whether full-day kindergarten attendance would moderate the relation between SES, ethnicity, and language, respectively, and early word reading attainment. That is, would full-day programs close group-based gaps in children's reading skills? It was hypothesized that there would be a greater difference in odds of attaining early word reading between low and middle/high SES children, Black or Hispanic and White children, and ELL and native English speaking children in half-day than full-day programs.

Aim two investigated the association between full-day kindergarten, early word reading attainment at the end of kindergarten, and subsequent reading skills in elementary school. It was hypothesized that early word reading attainment would mediate the relation between full-day kindergarten attendance and children's first, third, and fifth grade reading scores. This relation has not been tested in research on the effectiveness of full-day kindergarten. However, such knowledge is critical to making evidence-based decisions about how kindergarten should be structured (full- vs. half-day) to maximize children's learning, as well as what should be the emphasis of reading instruction during kindergarten. Thus, the results can have important policy implications by providing empirical evidence to justify expenditures on full-day programs or suggestions for potential revamping of such programs.

Method

Participants

Data in the present study came from the ECLS-K data set (Tourangeau et al., 2009), a nationally-representative, longitudinal study that followed approximately 18,000 children from the fall of 1998, at the start of children's kindergarten year. The present study is based on data collected in kindergarten and first, third, and fifth grades.

There were four inclusion criteria, consistent with those used in related research on the effects of full-day kindergarten (e.g., Walston et al., 2005; Yan & Lin, 2005). One, because research on achievement gaps focuses primarily on the lower performance of Black and Hispanic children than White children, especially in 1998 when ECLS-K began, (Chatterji, 2006; Reardon & Galindo, 2009), the present study included only children of these ethnicities. Two, data in this study were limited to children in public school. Although findings are mixed regarding the differential achievement of public and private school students (Braun, Jenkins, & Grigg, 2006; Riley, Cortines, & Forgione, 1997), prior research shows systematic differences between public and private schools on demographic characteristics of children, teachers' beliefs, class size and other factors (Lubienski, Lubienski, & Crane, 2008; Riley et al., 1997). For example, Walston and West (2004) found that children's poverty status and home language was related to full-day enrollment in public school but not private school. Three, only first time kindergartners were included because of systematic differences in the academic performance of first-time and repeating kindergartners (Burkam, LoGerfo, Ready, & Lee, 2007; Winsler et al., 2012). Four, the sample was limited to children who did not change schools during kindergarten because research has found differences between those who change/do not change schools during the year (Gruman, Harachi, Abbott, Catalano, & Fleming, 2008).

Table 1 shows the percentage of children excluded from the sample with each inclusion criterion. Children retained in the sample differed significantly from those excluded, with excluded children achieving higher reading scores at each time point. As well, a greater number of excluded children achieved early word reading. Private school attendance yielded the greatest reduction in sample size. There were

Table 1
Percent of children eliminated from sample with each inclusion criterion.

Criterion	*N*	% Lost
Initial sample	21,409	
Ethnicity	18,838	12.01
Public school	14,553	22.75
First-time kindergartner	12,012	17.46
Valid full-day kindergarten attendance data	11,935	0.64
Attended kindergarten 5 days/week	10,445	12.48
Did not change schools	9792	6.25

Note. Ethnicity refers to the total number of Black, Hispanic, and White kindergarteners in public school.

differences in the reading performance of private (excluded) and public (retained) school children, which was not unexpected given the mixed findings of prior research (e.g., Braun et al., 2006; Riley et al., 1997).

Table 2 shows the demographic characteristics of the final sample of 9,792, which was comparable proportionally to the full ECLS-K sample (Tourangeau et al., 2009). This sample consisted of 50% female, 43% low-SES, 61% White, 18% Black, 21% Hispanic, and 12% ELL children. Fifty-two percent of children attended full-day kindergarten programs and 48% attended half-day programs.

Measures

Full-day kindergarten attendance

Kindergarten teachers indicated whether they taught a morning, afternoon, or full-day class.

Child reading assessments

The reading assessments were developed for use in ECLS-K and included items created specifically for ECLS-K, as well as items adapted from commercial assessments and other NCES studies (e.g., Peabody Picture Vocabulary Test; Test of Early Reading Ability; Primary Test of Cognitive Skills; Woodcock-Johnson Tests of Achievement-Revised). Construct validity was further examined in third and fifth grades through comparison of the ECLS-K battery with the Woodcock-McGrew-Werder Mini Battery of Achievement (MBA) The correlation between reading scores for the ECLS-K and MBA batteries was .73, deemed as sufficiently high to support validation of item pools.

The reading measure was designed to be developmentally appropriate across grade levels. More specifically, nine levels of reading proficiency were assessed: (1) letter recognition, (2) beginning sounds, (3) ending sounds, (4) sight words, (5) words in context, (6) literal inferences, (7) extrapolation, (8) evaluation, and (9) evaluation of nonfiction. There was a degree of overlap in the levels assessed in each grade, with levels 1–5 assessed in kindergarten and first grade, levels 4–8 assessed in third grade, and levels 6–9 assessed in fifth grade.

In kindergarten and first grade, children were asked to identify upper- and lower-case letters by name, associate letters with sounds at the beginning and end of words, and recognize common sight words. In third grade, children were also asked to read words in context, use cues and keywords to make literal inferences, and extrapolate by identifying clues used to make inferences and using personal background knowledge and cues to understand homonyms. In fifth grade, children were also asked to evaluate non-fiction by comprehending biographical and expository text.

The internal consistency of the reading test ranged from .91 - .96 across data collection rounds (Pollack, Najarian, Rock, & Atkins-Burnett, 2005; Pollack, Rock, Weiss, & Atkins-Burnett, 2005; Rock & Pollack, 2002). Split half-reliability in the early word reading skills - letter knowledge, beginning sounds, ending sounds, and sight words - ranged from .56-.83.

Table 2
Demographic characteristics of the kindergarten children.

Demographic characteristics	Half-day N (%)	Full-day N (%)
Male	2422 (49)	2519 (51)
Female	2314 (48)	2537 (52)
Low-SES	1815 (43)	2384 (57)
Middle/high-SES	2921 (52)	2672 (48)
White	3203 (54)	2754 (46)
Black	403 (22)	1396 (78)
Hispanic	1130 (55)	906 (45)
English language learners (ELL)	635 (57)	482 (43)
Native English speakers	4094 (47)	4564 (53)

Note. Low-SES children were those who fell into the two lowest SES quintiles; middle/high-SES children were those in the three higher quintiles. ELL children were those whose primary home language was not English.

Scores on reading assessments

ECLS-K includes several types of reading scores, including Item Response Theory (IRT) and proficiency probability scores (Tourangeau et al., 2009). IRT scale scores provide a global reading score and are an estimate of the number of items a child would have answered correctly if administered all items in the first and second stage reading tests (Tourangeau et al., 2009). IRT reading scale scores were used as a proxy for children's reading performance at kindergarten entry and in the spring of first, third, and fifth grades.

Probability scores range from 0 to 1 and estimate the probability of passing a level based on children's responses to clusters of items for each level of reading proficiency (four-item clusters). Thus, these scores allow one to consider whether a child is attaining a specific set of skills. Proficiency probability scores were provided for each reading proficiency level.

The present study used end-of-kindergarten proficiency probability scores to classify children as having early word reading skills. The early word reading score was adapted from Kaplan and Walpole (2005). As noted previously, Kaplan and Walpole, using ECLS-K data, found that children who were classified as early word readers, as indicated by high probability of passing letter knowledge, beginning sounds, and ending sounds and low or moderate probability of passing sight words, at the start of first grade had high likelihood of acquiring reading comprehension skills. The present study adapted use of the early word reading category to examine acquisition of this skill set at the end of kindergarten. High probability was defined as .75 or higher (at least 3 out of 4 items) and at least low probability as .25 or higher (at least 1 out of 4 items). Children who had high proficiency probability for letter recognition, beginning sounds, and ending sounds and at least low proficiency probability for sight words were classified as having attained early word reading. Other children were classified as non-early word readers. The dichotomous indicator of early word reading provides information on the degree of children's performance on important early reading skills. Children classified as early word readers performed well on indicators of letter knowledge and phonological skills (beginning and ending sounds), and were at least starting to acquire sight word skills.

Demographics

Children's race/ethnicity, SES and language were obtained from parent interviews.

Race/ethnicity

Ethnicity was dummy-coded for Black and Hispanic groups; White children were the referent group.

SES

SES was derived from quintiles provided by ECLS-K, which were based on parents' income, education, and occupation. Consistent with other research (e.g., Chatterji, 2006), in this study, the quintiles were categorized so that the two lower quintiles were classified as low-SES and the three upper quintiles were classified as middle/high-SES.

Language status

ECLS-K derived the home language variable from parent-provided information about the language(s) spoken at home. In the present study, children whose primary home language was English were classified as native English speakers; others were classified as ELL.

Covariates

Prior research on children's reading development has found associations with children's gender (Chatterji, 2006; Walston et al., 2005), preschool attendance (Magnuson, Ruhm, & Waldfogel, 2007), kindergarten home literacy environment (Baker, Mackler, Sonnenschein, & Serpell, 2001; NICHD ECCRN, 2005b; Yeung, Linver, & Brooks-Gunn, 2002), kindergarten entry scores (Kaplan & Walpole, 2005; Scanlon & Vellutino, 1996; Sonnenschein, Stapleton, & Benson, 2010), kindergarten class size (Yan & Lin, 2005), amount of class time spent reading in elementary grades (Magnuson et al., 2007), and school attendance in kindergarten (Morrisey, Hutchison, & Winsler, 2014). Accordingly, these variables were included as covariates in analyses.

Parents provided information regarding child's gender, preschool, and indicators of the home literacy environment (Tourangeau et al., 2009). Preschool attendance was based on whether children reportedly attended center care (i.e. day care, Head Start, nursery school, preschool) in the year prior to kindergarten. The home literacy environment was a composite of four items, including the reported frequency (4-point scale ranging from never to everyday) with which parents read to their child, and their child looked at picture books and read outside of school, and whether (yes/no) their child visited the library. The home literacy component variables were centered prior to summing because the library visitation variable was on a different scale than the other component variables.

Children's kindergarten entry scores were based on their IRT reading scale score at the start of kindergarten. Class size was created by summing kindergarten teacher-reported number of boys and girls. The amount of time spent reading in elementary grades, a control variable in 1st, 3rd, and 5th grade analyses, was based on teachers' reported frequency of the amount of class time spent in reading (4-point scale ranging from 1 to 30 min a day to more than 90 min a day). School attendance was measured by the total number of days that a child was absent from school during the kindergarten year.

Procedure

Teachers completed questionnaires in the fall of kindergarten. Parents were interviewed in the fall and spring of kindergarten by trained research assistants. Children were individually administered reading assessments in the fall and spring of kindergarten and the spring of first, third, and fifth grades by trained assessors.

Analysis plan

Addressing complex sampling design

ECLS-K employed a multi-stage, stratified sampling design including oversampling, stratification and clustering. Analyses utilized the C1_6FP0 longitudinal weight developed by ECLS-K to aid in inferential statistics and account for differential sampling rates and nonresponse (Tourangeau et al., 2009). The C1_6FP0 longitudinal weight is appropriate for children who have parent and/or child, teacher, or classroom data in the fall and spring of kindergarten and spring of first, third, and fifth grades, as was the case in this study. Taylor linearization was applied to account for both stratification and clustering (Stapleton, 2008).

Preliminary analyses

Preliminary analyses compared half- and full-day students on covariates that are known to relate to reading achievement and may differentiate students enrolled in full- versus half-day programs. Covariates considered included SES, race/ethnicity, language, preschool attendance, home literacy environment, class size, class time spent in reading and language arts activities (1st, 3rd, and 5th grade), kindergarten entry scores, and school attendance in kindergarten. Preliminary analyses also considered differences between full- and half-day children on the component early word reading skills at the start of kindergarten (letter knowledge, beginning sounds, ending sounds, and sight words).

ANOVA and χ^2 analyses were used to examine differences between full- and half-day children. SES was controlled when examining reading skills and home literacy environment given documented differences between low- and higher-SES children (Reardon et al., 2012).

Early word reading attainment in kindergarten

Multiple logistic regression was used to predict full- and half-day children's early word reading attainment at the end of kindergarten, as well as interactions of full-day kindergarten attendance with children's demographic characteristics (i.e., SES, ethnicity, language).

Long-term benefit of full-day kindergarten

The present study hypothesized that early word reading would mediate the association between attending full-day kindergarten and children's reading scores in 1st, 3rd, and 5th grade. Traditional mediation analysis (Baron & Kenny, 1986) requires a significant direct effect of the predictor on outcome. However, advances in mediation analysis assert that a direct effect does not have to be present (MacKinnon, 2008; Zhao, Lynch, & Chen, 2010). Instead, the only necessary condition to establish mediation is the presence of a significant indirect effect (Zhao et al., 2010). Further, there can be a positive indirect effect even when there is a lack of a direct effect or in the presence of a negative direct effect (Zhao et al., 2010). Such competing direct and indirect effects are even expected when there may be multiple processes underlying the mediation (Hayes, 2013; MacKinnon, Fairchild, & Fritz, 2007).

In the present study, it was expected that children in full-day kindergarten would be more likely to acquire early word reading skills, given prior research showing the initial benefits of full-day kindergarten (e.g., Cooper et al., 2010). It also was expected that acquiring early word reading skills would relate to higher reading performance beyond kindergarten, given research emphasizing the benefits of early reading (e.g., Snow et al., 1998). However, it was also expected that children in full-day kindergarten would be more likely to be academically at-risk compared to half-day children, given research on the demographic characteristics of students attending both programs (Lee et al., 2006). Therefore, children in full-day kindergarten might underperform, in the long-term, relative to half-day peers, particularly given prior research showing a fade-out or reversal of the full-day effect (e.g., DeCicca, 2007; Votruba-Drzal et al., 2008). Nonetheless, it was expected that acquisition of early word reading by the end of kindergarten would play a role in the maintenance of the full-day kindergarten benefit; as such, a positive direct effect was not required for mediation analyses in the present study.

Two necessary path estimates were obtained to calculate the mediated effect. Multiple logistic regression was used to examine the effect of full-day kindergarten on early word reading. Multiple regression examined the effect of early word reading on reading scores in first, third, and fifth grades, respectively. Because the path estimates are on different scales, estimates were standardized by calculating the quotient of the path estimate and its standard error prior to obtaining and testing the mediated effect (Iacobucci, 2012). The mediated effect was obtained by calculating the product of the standardized path estimates. The standard error of the mediated effect was calculated by taking the square root of the sum of the squared path estimates and the constant 1. Finally, the mediated effect was tested by calculating the quotient of the mediated effect and its standard error, and comparing to $z_{crit} = 1.96$ to determine the significance of the mediated effect. This series of mediation steps was completed for first, third and fifth grades.

An alpha level of .05 was used to determine statistical significance in all analyses.

Results

Preliminary analyses

Black children and those from low SES backgrounds comprised a significantly higher percentage of attendees in full-day (Black: 35%, χ^2 (1, N = 289) = 288.46, p < .001; low-SES: 47%, χ^2 (1, N = 289) = 24.88, p = .012) than half-day kindergarten programs (Black 11%; low-SES: 40%). There was no difference in the number of Hispanic children attending full- versus half-day programs (χ^2 (1, N = 289) = 11.34, p = .193). Interestingly, however, a significantly higher percentage of ELL children attended half-day (15%) than full-day programs (9%) (χ^2 (1, N = 289) = 35.20, p = .005).

Children in full-day classrooms experienced slightly larger class sizes (M = 21.23) than children in half-day programs (M = 20.23), F(1, 286) = 4.25, p = .040. As would be expected, full-day teachers (M = 3.04, SE = 0.044) reported spending significantly more time in reading and language arts activities than half-day teachers (M = 2.25, SE = 0.047), t(280) = −11.51, p < .001. Full-day teachers reported spending approximately 61 to 90 min in reading and language arts activities; half-day teachers spent 31 to 60 min. Full- and half-day children did not differ on school attendance during kindergarten, t(348) = −0.75, p = .454.

Full- and half-day children did not differ on kindergarten entry reading IRT scores, F(1, 279) = 1.63, p = .203, or the percentage of children demonstrating proficiency in specific reading skills at the start of kindergarten. The majority of students (53% full-day, 51% half-day) entered kindergarten proficient in letter knowledge. Fifteen percent of both groups entered kindergarten proficient in beginning sounds. Far fewer children entered kindergarten proficient in the more advanced skills of ending sounds (5% full-day, 6% half-day), and sight words (2% full-day, 3% half-day). Children in full- and half-day kindergarten did not differ on their home literacy environment, F(1, 289) = 2.44, p = .119 or preschool attendance, χ^2 (1, N = 289) = 11.97, p = .100.

Bivariate correlations among all analytic variables are shown in Table 3. Descriptive statistics for main effects and covariates are shown in Table 4.

Full-day kindergarten attendance and children's reading skills in kindergarten

Early word reading attainment

After controlling for gender, SES, ethnicity, language, preschool attendance, kindergarten entry scores, class size, home literacy environment, and school attendance in kindergarten, children in full-day programs had nearly 15 greater odds of attaining early word reading than those in half-day programs (b = 2.69, SE = .980, p = .007, 95% CI [0.75, 4.62]; Fig. 1).[2] There were 22% of children in full-day programs that attained early word reading compared to 15% of those in half-day programs. Note that only 18% of children attained early word reading.

Full-day kindergarten and demographic characteristics of students

Consistent with hypotheses, after controlling for the covariates, full-day attendance moderated the relation between SES and early word reading attainment at the end of kindergarten, (b = 1.81, SE = .525, p = .001, 95% CI [0.78, 2.85]). In half-day kindergarten, middle/high-SES children were more than 3.5 times more likely to attain early word reading than low-SES children (b = −0.72, SE = .330, p = .032, CI [−1.38, −0.06]). In contrast, low-SES children attending full-day programs had more than 2.0 greater odds of attaining

[2] A separate set of analyses replicated the effects without including the covariates. The outcomes were similar in pattern but of smaller magnitude.

Table 3
Bivariate correlations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Girl	1																					
Black	2	.013																				
Hispanic	3	.009	n/a																			
Mid/High-SES	4	-.004	-.258**	-.316**																		
Native English	5	-.001	.030**	-.613**	.250**																	
Preschool Attendance	6	-.006	-.114**	-.044**	.134**	-.008																
Home literacy environment	7	.229**	-.042**	-.123**	.128**	.127**	.047**															
Class size	8	.018	.117**	.134**	-.012	-.077**	.015	-.008														
Fall K reading	9	.069**	-.172**	-.154**	.283**	.096**	.115**	.212**	-.011													
Spring K letter recognition	10	.091**	-.168**	-.164**	.229**	.101**	.086**	.143**	.000	.359**												
Spring K beginning sounds	11	.115**	-.224	-.179**	.299**	.118**	.106**	.203**	-.006	.555**	.748**											
Spring K ending sounds	12	.102**	-.215**	-.166**	.304**	.114**	.108**	.220**	-.008	.645**	.568**	.933**										
Spring K Sight Words	13	.061**	-.130**	-.100**	.219**	.066**	.071**	.208**	-.002	.719**	.249**	.519**	.716**									
First grade reading	14	.085**	-.222*	-.187**	.300**	.130**	.095**	.219**	-.018	.672**	.461**	.646**	.717**	.705**								
Third grade reading	15	.094**	-.325**	-.296**	.375**	.211**	.102**	.176**	-.037**	.543**	.470**	.612**	.638**	.502**	.726**							
Fifth grade reading	16	.067**	-.345**	-.312**	.389**	.218**	.119**	.152**	-.053	.506**	.476**	.601**	.615**	.460**	.686**	.852**						
First grade RLA time	17	.006	-.041**	-.008	.008	.016	.022	.002	.015	.017	.013	.018	.016	.013	.029*	.024	.037*					
Third grade RLA time	18	.029*	-.014	.067**	-.017	.053**	-.007	-.008	.007	-.024	-.020	-.029*	-.025	-.012	-.027	-.022	-.016	.039**				
Fifth grade RLA time	19	.006	.117**	.170**	-.109**	-.116**	-.016	-.017	.060**	-.041**	-.022	-.022	-.014	-.005	-.038	-.057**	-.052**	.005	.094**			
Early word reading	20	.049**	-.105**	-.087**	.188**	.055**	.056**	.173**	.005	.575**	.199**	.433**	.624**	.874**	.592**	.430**	.391**	.007	.002	-.002		
School attendance in kindergarten	21	.021	.061**	.095**	-.150**	-.034**	-.058**	-.023*	.056**	-.116**	-.156**	-.165**	-.149**	-.082**	-.124**	-.128**	-.115**	.009	.040**	.018	-.064**	
Full-day kindergarten	22	.013	.265**	-.015	-.089**	.061**	-.033**	.035**	.130**	-.001	.054**	.072**	.079**	.070**	-.008	-.042**	-.068**	-.071**	-.031*	-.027*	.069**	0.007

* p < .05.
** p < .01.

Table 4
Descriptive statistics.

	Min	Max	Mean (SD)
Home literacy environment	−11.44	4.56	.004 (2.82)
Class size	3	57	20.67 (4.24)
Fall K reading	21.01	138.51	34.39 (9.26)
Spring K letter recognition	.008	1	0.92 (.18)
Spring K beginning sounds	.001	1	0.68 (.33)
Spring K ending sounds	.000	1	0.49 (.34)
Spring K sight words	.000	1	0.14 (.24)
School attendance in kindergarten[a]	.000	182.00	9.60 (10.86)
First grade reading	25.11	184.05	76.28 (22.76)
Third grade reading	51.46	200.75	125.77 (27.71)
Fifth grade reading	65.57	203.22	149.19 (26.18)
First grade RLA[b] time	1	4	3.53 (.68)
Third grade RLA[b] time	1	4	3.23 (.80)
Fifth grade RLA[b] time	1	4	2.90 (.82)

[a] School attendance is measured by number of absences in kindergarten.
[b] RLA is reading and language arts.

early word reading skills than middle/high-SES children ($b = 1.27$, $SE = .463$, $p = .007$, CI [0.36, 2.19]).

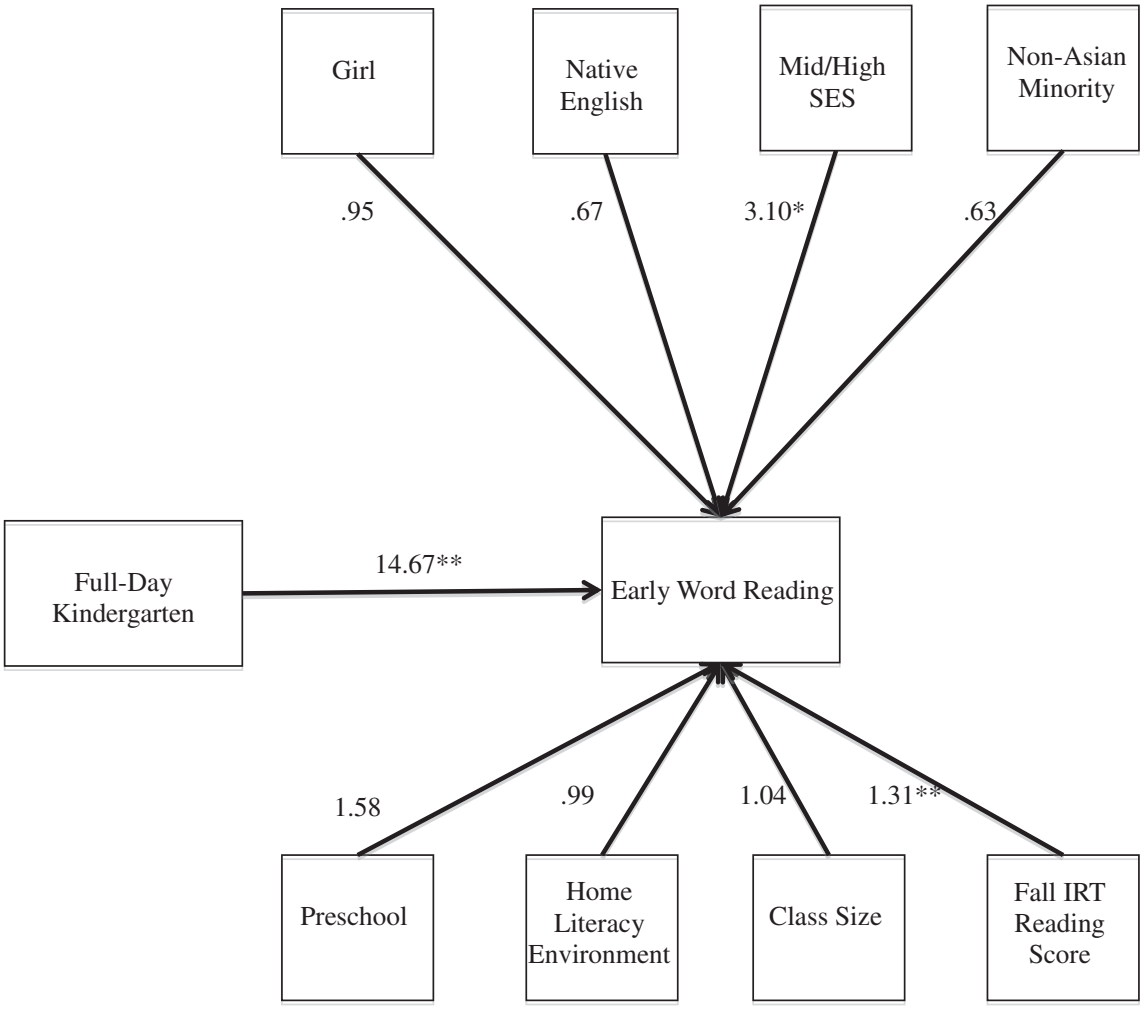
In contrast to findings for SES, after including covariates, full-day attendance did not moderate the relation between ethnicity and early word reading attainment, $b = -0.23$, $SE = .387$, $p = .559$, 95% CI [−0.99, 0.54]. The main effect of ethnicity on early word reading attainment was not statistically significant, $b = -0.47$, $SE = .357$, $p = .191$, 95% CI [−1.17, 0.24]. Similarly, full-day attendance did not moderate the relation between language status (native English speakers, ELL children) and children's early word reading attainment at the end of kindergarten, $b = 0.29$, $SE = .880$, $p = .746$, 95% CI [−1.45, 2.02]. The main effect of children's language also was not statistically significant, $b = -0.40$, $SE = .712$, $p = .572$, 95% CI [−1.81, 1.00].

Full-day kindergarten attendance and children's reading scores in elementary school

The mediated effect of full-day kindergarten on first, third, and fifth grade reading scores, respectively, through early word reading attainment was tested controlling for gender, SES, ethnicity, language, kindergarten entry scores, amount of class time spent in reading, and kindergarten school attendance.

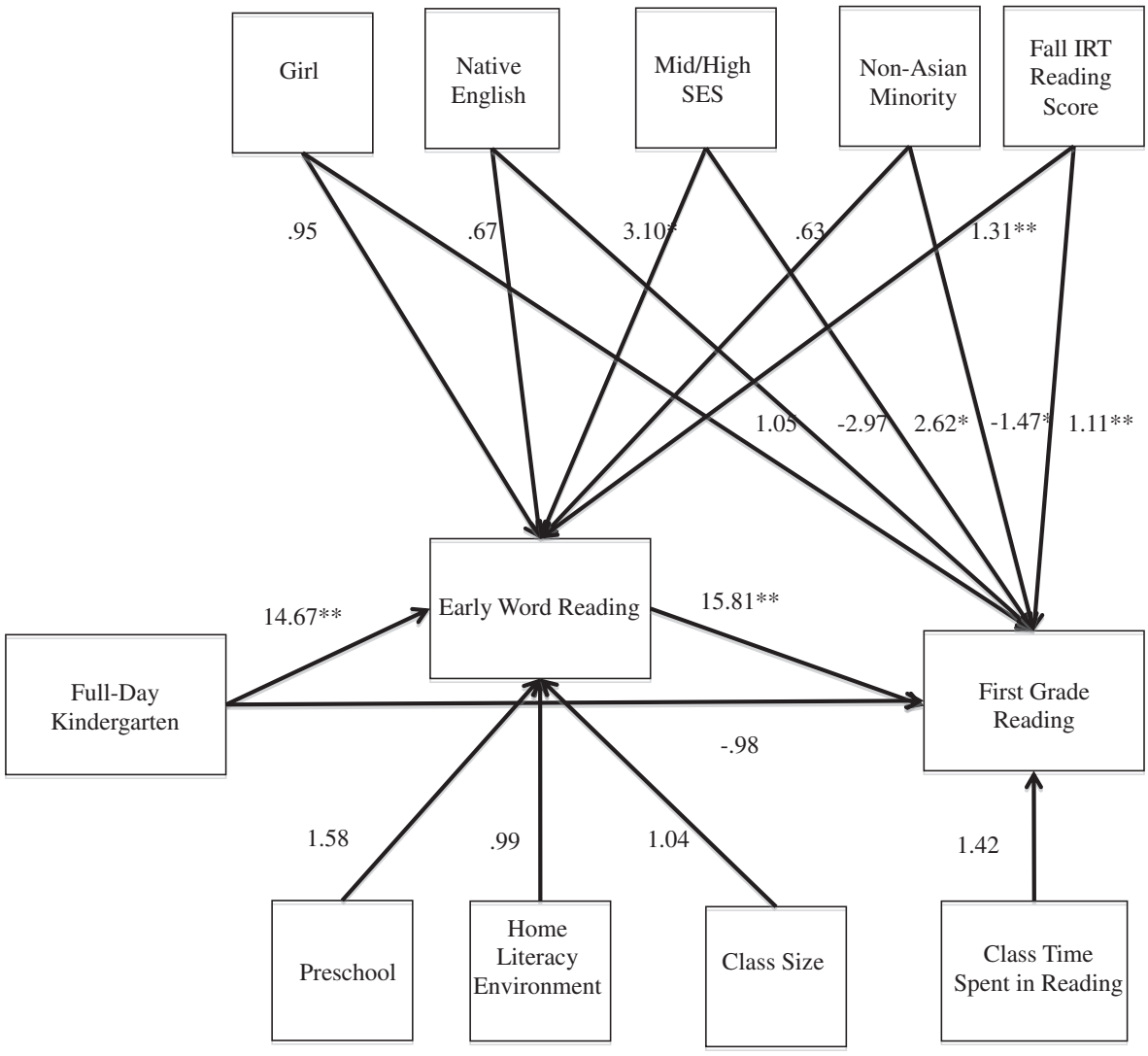
First grade

There was a significant mediated effect of full-day kindergarten on first grade reading scores, $z = 2.65$, $p = .004$ (Fig. 2). Children who attended full-day kindergarten had 15 greater odds of attaining early word reading than those in half-day kindergarten ($b = 2.69$, $SE = .980$, $p = .007$, 95% CI [0.75, 4.62]). Early word reading attainment in



Note. Figure displays odds ratios (*p < .05, **p < .01). Significant interactions are reported in text.

Fig. 1. End of kindergarten early word reading attainment.



Note. Early Word Reading predictors display odds ratios. First Grade Reading predictors display coefficients. *p < .05, **p < .01.

Fig. 2. First grade mediation model.

kindergarten predicted first grade reading scores that were significantly higher than those for children who did not attain early word reading ($b = 15.81$, $SE = 1.438$, $p < .001$, 95% CI [12.97, 18.64]. There was no direct effect of full-day kindergarten on first grade reading scores ($b = -0.98$, $SE = 1.256$, $p = .436$, 95% CI [−3.46, 1.50].

Third grade

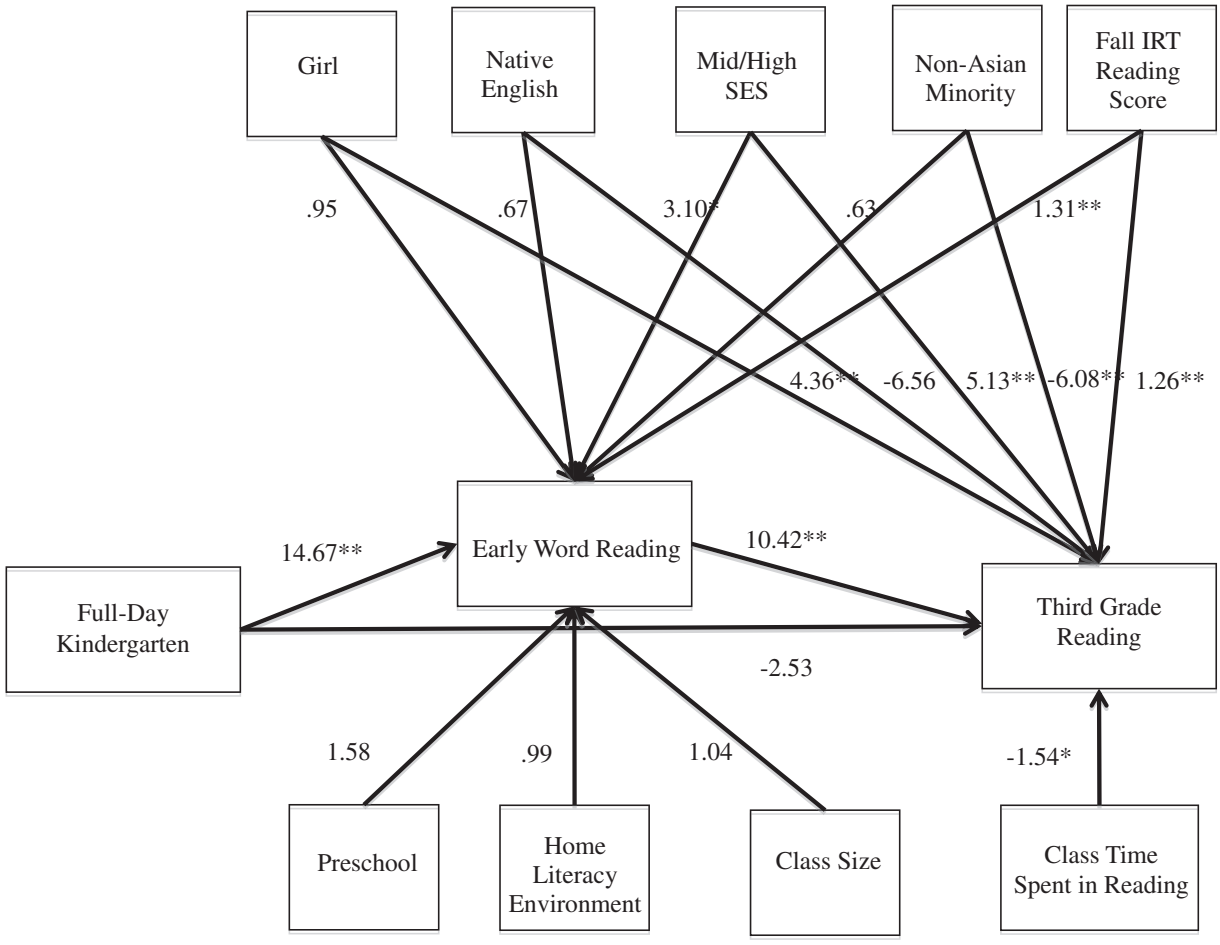
There was a significant mediated effect of full-day kindergarten on third grade reading scores, $z = 2.39$, $p = .008$ (Fig. 3). Children in full-day kindergarten had 15 greater odds of attaining early word reading than those in half-day kindergarten ($b = 2.69$, $SE = .980$, $p = .007$, 95% CI [0.75, 4.62]). Attainment of early word reading skills by the end of kindergarten predicted third grade reading scores that were significantly higher than those for children who did not attain early word reading ($b = 10.42$, $SE = 2.007$, $p < .001$, 95% CI [6.45, 14.38]). There was no direct effect of full-day kindergarten on third grade reading scores ($b = -2.53$, $SE = 1.553$, $p = .105$, 95% CI [−5.59, 0.54]).

Fifth grade

There was a significant mediated effect of full-day kindergarten on fifth grade reading scores, $z = 2.36$, $p = .009$ (Fig. 4). Full-day kindergarten predicted 15 greater odds of attaining early word reading than those in half-day kindergarten ($b = 2.69$, $SE = .980$, $p = .007$, 95% CI [0.75, 4.62]). Early word reading attainment predicted fifth grade reading scores that were significantly higher than those for children who did not attain early word reading ($b = 8.46$, $SE = 1.699$, $p < .001$, 95% CI [5.11, 11.81]). There was no direct effect of full-day kindergarten on fifth grade reading scores ($b = -1.88$, $SE = 1.308$, $p = .152$, 95% CI [−4.46, 0.70]).

The relation between SES and children's reading scores in elementary grades

As discussed previously, full-day kindergarten moderated the relation between SES and early word reading attainment at the end of kindergarten, such that SES-related gaps in attainment of this advance skill



model.

Note. Early Word Reading predictors display odds ratios. Third Grade Reading predictors display coefficients.
*p < .05, **p < .01.

Fig. 3. Third grade mediation model.

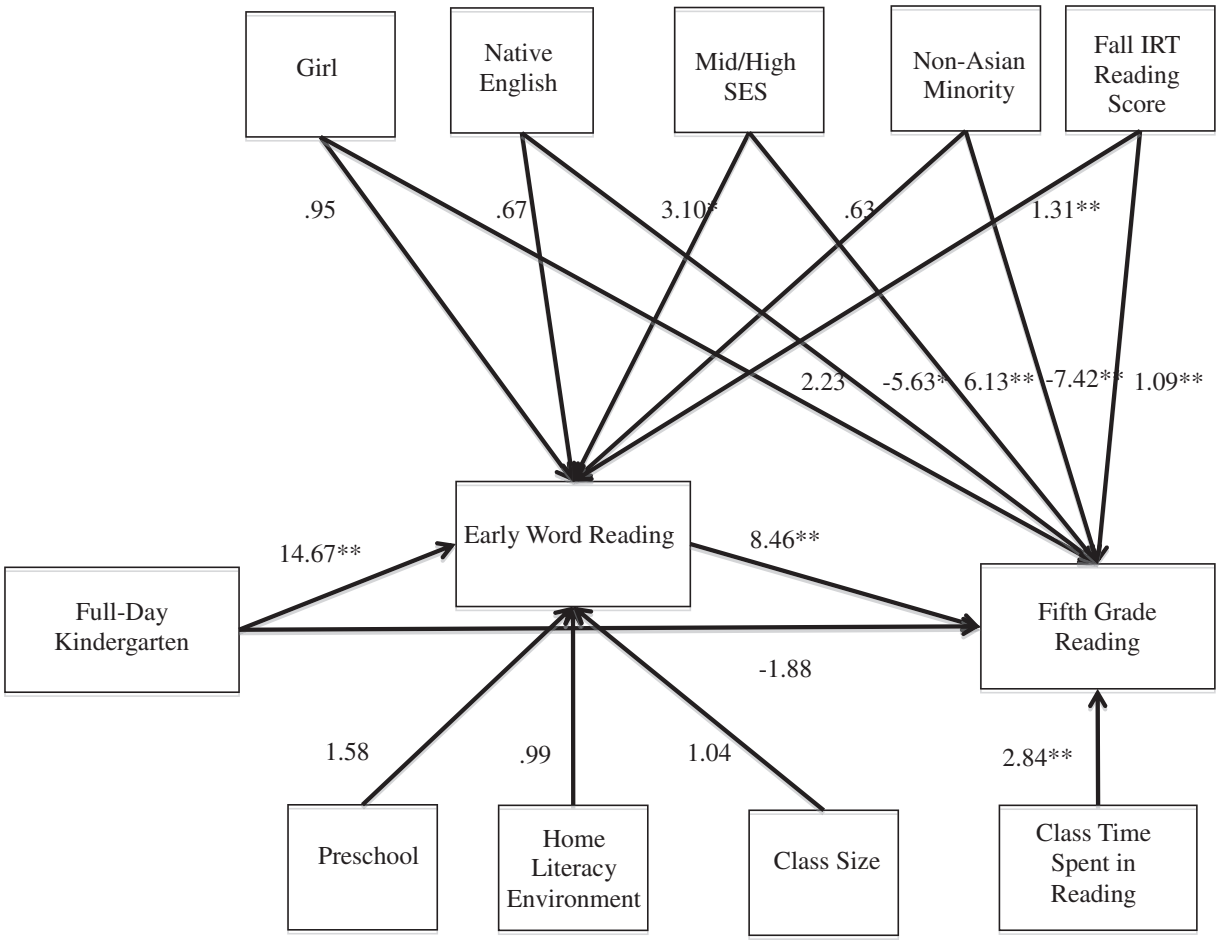
set were smaller in full-day kindergarten. Recall that previous research has shown early reading skills to be predictive of later reading outcomes (Kaplan & Walpole, 2005; Sonnenschein et al., 2010). Therefore, post-hoc analyses examined whether attainment of early word reading skills at the end of kindergarten decreased or eliminated SES differences in reading scores in the elementary grades. Linear regressions were conducted predicting first, third, and fifth grade IRT reading scores from SES, after controlling for gender, language, ethnicity, kindergarten entry scores, amount of class time spent reading, full-day kindergarten attendance, and school attendance in kindergarten.

Eleven percent of low-SES children achieved early word reading by the end of kindergarten. The results provide some support that attaining early word reading skills in kindergarten decreases potential SES differences in elementary school. For children who attained early word reading by the end of kindergarten, SES did *not* significantly predict first grade ($b = 0.51$, $SE = 2.808$, $p = .855$), third grade ($b = 1.61$, $SE = 3.207$, $p = .618$), or fifth grade ($b = 2.79$, $SE = 2.759$, $p = .315$) reading scores. However, among children who did not attain early word reading by the end of kindergarten, SES related differences were borderline in first grade ($b = 2.40$, $SE = 1.398$, $p = .089$), and significant in third grade ($b = 4.59$, $SE = 1.980$, $p = .022$) and fifth grade ($b = 5.11$, $SE = 1.607$, $p = .002$), with middle/high-SES children earning significantly higher reading scores than low-SES children. Although such relatively few low-SES children attained early word reading, their percentages were expected given that only 18% of the overall sample attained early word reading.

Discussion

This study examined the long-term effects of full-day kindergarten on children's reading outcomes. Unlike other studies which compared full- and half-day children on their overall performance on measures of reading (Walston & West, 2004; Zvoch et al., 2008), this study examined differences in the attainment of a specific set of reading skills, early word reading, and how that skill attainment, in turn, relates to the long-term outcomes of full-day kindergarten students. The skills that comprise early word reading are viewed by many theorists and researchers (e.g., Phillips & Torgesen, 2006; Storch & Whitehurst, 2002; Whitehurst & Lonigan, 2001) as a necessary foundation for the development of future reading skills. In addition, prior research shows attaining early word reading skills by the end of kindergarten is associated with reduced SES-related gaps in first grade (Kaplan & Walpole, 2005). Moreover, proficiency in early word reading is consistent with recommendations by the Common Core of State Standards (National Governors Association Center for Best Practices, & Council of Chief State School Officers, 2010).

As predicted, children in full-day programs were significantly more likely than those in half-day programs to attain early word reading.



Note. Early Word Reading predictors display odds ratios. Fifth Grade Reading predictors display

Fig. 4. Fifth grade mediation model. Note. Early Word Reading predictors display odds ratios. Fifth Grade Reading predictors display coefficients. *p < .05, **p < .01.

The additional school time experienced by children in full-day kindergarten is related to greater learning than half-day programs. These findings extend prior research (Baskett et al., 2005; Lee et al., 2006; Votruba-Drzal et al., 2008; Walston & West, 2004; Yan & Lin, 2005; Zvoch et al., 2008; cf. Gullo & Clements, 1984; Meyer, Wardrop, Hastings, & Linn, 1993) by identifying a set of reading skills more likely to be attained by children in full-day kindergarten.

A second set of analyses investigated whether the effects of full-day attendance on early word reading attainment varied for children from different demographic backgrounds. As expected, low-SES children in half-day kindergarten were significantly less likely to attain early word reading skills than their middle/high-SES counterparts. In contrast, low-SES children had greater odds of early word reading attainment than middle/high-SES children in full-day kindergarten. These findings are particularly important given the increasing SES-related achievement gaps (Reardon, 2011). Contrary to hypotheses, however, attending full-day kindergarten did not decrease the gap in reading skills between Black/Hispanic and White children or ELL and native English speaking children. That is, although full-day kindergarten was advantageous, it was not differentially advantageous for these groups (see also Lee et al., 2006; Walston et al., 2005; Zvoch et al., 2008; cf. Yan & Lin). Such findings suggest that although full-day programs may be beneficial, they should not necessarily be viewed as a means of decreasing or closing the gaps between different groups of children. It is possible that the amount of instruction is not sufficient to improve early word reading skills for children who are most at risk for difficulties (Connor, Morrison, & Katch, 2004). Relatedly, the nature of the resources available in these children's schools may have been too limited even with the extra hours of instruction to show a differential benefit (Carter, 2013; Flores, 2007; Rothstein, 2013; Welner & Carter, 2013).

The primary purpose of the present study was to examine whether reading skills attained in kindergarten mediated the relation between full-day kindergarten and reading scores in first, third, and fifth grades. Findings in this study were consistent with prior research showing a diminished or reversed direct effect of full-day kindergarten on later reading (Votruba-Drzal et al., 2008; Walston et al., 2005). Full-day kindergarten may not continue to yield benefits because of children's experiences outside of the school context. For example, because full-day attendees, on average, enter elementary school performing well, more support may be offered to other students, which can lead to loss of learning opportunities for full-day attendees and/or gains in learning for other students (Le, Kirby, Barney, Setodji, & Gershwin, 2010). Alternatively, Zvoch (2009) found evidence of summer learning loss, such that full-day children, who were primarily from lower-income families, experienced greater summer learning loss of phoneme skills than half-day peers, who were primarily from middle-income families. These explanations highlight the need to consider skills acquired during kindergarten and their relation to later reading performance.

The present study showed the importance of attainment of early word reading skills for the maintenance of the full-day benefit. The attainment of early word reading skills in kindergarten mediated relations between full-day kindergarten attendance and subsequent reading scores in first, third, and fifth grades. This is in contrast to findings from research that only considered global reading scores in the

elementary grades (Cannon et al., 2006; Rathbun & West, 2004). Not only are full-day children more likely to attain early word reading skills, these skills, in turn, are associated with their reading scores through fifth grade. Thus, whether there is a long-term benefit of full-day kindergarten depends on the reading skills children acquire, not only on the amount of time spent in kindergarten. Children who attain early word reading in kindergarten may have reading skills more in keeping with first grade teachers' expectations. Research by Connor and colleagues (Connor et al., 2004; Morrison & Connor, 2002) confirms the importance of a match between children's skills and instruction. Unfortunately, they found that reading instruction in the first few years of school did not well match the needs of children with more limited reading skills. In keeping with reading research, later success in reading skills is associated with foundational, early reading skills (Phillips & Torgesen, 2006; Storch & Whitehurst, 2002), which the present study demonstrates as important for the long-term outcomes of children in full-day kindergarten.

There are known disparities in achievement between lower and higher-SES students that only widen as children progress through school (Reardon, 2011; Reardon et al., 2012; Snow et al., 1998). However, acquisition of early word reading attainment by the end of kindergarten was associated with decreased SES-related differences in reading achievement during the elementary grades. This is consistent with Kaplan and Walpole's (2005) finding that early word reading attainment by the start of first grade eliminated SES-related gaps in reading acquisition. Such findings support the importance of addressing at-risk children's learning needs by the start of school (Sonnenschein et al., 2010).

Although improving early word reading skills by the end of kindergarten is an important contribution of full-day programs, we want to emphasize the need also to address what Lesaux (2012) calls knowledge-based competencies (vocabulary, content or background knowledge). These are in contrast to the skills-based competencies (e.g., early word reading and its components), which were the focus of this study. Several researchers have cogently argued that the locus of group-based differences in later elementary school is differences in knowledge-based skills (Lesaux, 2012; Murnane, Sawhill, & Snow, 2012; Reardon et al., 2012). Duke and Block (2012) reviewed evidence suggesting that teachers in early elementary school are not sufficiently addressing children's knowledge-based competencies. This is particularly important for those children considered at risk because they do not necessarily receive compensatory opportunities at home to develop such skills (Waldfogel, 2012). Thus, by the time the children who are most at-risk are in the middle grades of elementary school, even if they have developed early word reading skills, their weakness in knowledge-based skills limits their comprehension of texts.

Limitations

Although these findings add important information to existing research on full-day kindergarten attendance, there are five limitations to the present study that need to be taken into account. One, teacher and parent data were self-reported. Social desirability may have played a role in parents' and teachers' reports of home literacy environment activities and the amount of time spent in reading and language arts activities, respectively. Two, the data in this study were correlational. Although no causal implications can be drawn from the findings, the longitudinal nature of the data allows one to consider temporal patterns. Three, the study did not consider the types of reading instruction the children received or teacher/school characteristics, any of which may be associated with differences in children's reading outcomes in full/half day kindergarten. Four, this study focused only on reading performance. We did not consider children's social/emotional skills, which many have found relevant for academic performance (see Le et al., 2010). Five, these data came from a cohort that entered kindergarten in 1998. Much has changed since that time including a greater number of children attending full-day programs (Child Trends Data Bank, 2015) and increased emphasis on early word instruction (Duke & Block, 2012). It is possible that the findings from 1998 are not consistent with what children in the present day are learning. That is, if there is presently a greater instructional emphasis on early word reading, more children will attain proficiency in those skills. Nevertheless, these data do portray a relevant picture for what full-day kindergarten has to offer different groups of children in kindergarten as they go through elementary school. Thus, these findings are useful in understanding the association between attaining early word reading skills in kindergarten, the role of full-day kindergarten in such attainment and the association between early word reading in kindergarten and reading development in elementary school.

Implications and future directions

This study showed that full-day kindergarten is associated with reading skill acquisition during the kindergarten year and, in turn, reading performance in elementary school. Future research should consider qualitative differences between full- and half-day programs. Elicker and Mathur (1997) found that children in full-day programs spent significantly more time in one-to-one teacher-student interactions, and child-initiated activities, and less time in large group, teacher-directed activities than children in half-day programs (see also Le et al., 2010). Perhaps the additional time in school allows for higher quality interactions and activities, which may be more beneficial for student learning, engagement, and academic outcomes. On the other hand, Hall-Kenyon et al. (2009), using a fairly small sample, found no differences in classroom quality, assessed with the Classroom Assessment Scoring System (CLASS), between full- and half-day programs. They noted that instructional quality was adequate but not high. In contrast, emotional support was high. They suggested a need to improve the amount and quality of systematic and explicit instruction (see also Pianta & La Paro, 2003).

It is important to note that only 18% of children in the present study (22% full-day; 15% half-day) attained early word reading skills by the end of kindergarten. This relatively low percentage is consistent with small effect sizes found in other studies using global reading scores (e.g., Yan & Lin, 2005). It underscores the need for resources to be geared towards helping kindergarten children become proficient in the component skills of early word reading, particularly the relatively more advanced skills of ending sounds and sight words. As we have noted elsewhere, however, it is equally important to address children's knowledge-based skills and not focus solely on skills-based competencies (e.g., early word recognition). That is, teachers need to be made aware of the importance of fostering growth in children's content knowledge (e.g., vocabulary, conceptual knowledge; Lesaux, 2012). This may be particularly important for children who start school with limited reading-related skills and lack the requisite experiences to build the content knowledge that will be important for reading comprehension (Lesaux, 2012). Moreover, as Murnane et al. (2012) note, the difficulty level and complexity of what children are expected to read has increased substantially over the years. However, instruction for these children has not kept pace with the increased expectation (Duke & Block, 2012).

Children from certain demographic groups (e.g., low SES, Black, Hispanic) often attend schools that have more limited resources than those serving higher SES or White children. Carter (2009, 2013) discusses this as an opportunity gap (see also Flores, 2007). Although the opportunity gap is used to describe differences in educational opportunities available to children from different demographic backgrounds, the opportunity gap may differ across educational jurisdictions and states (Cannon et al., 2006). In addition, Murnane et al. (2012) suggest that many of the group-based gaps evident today, at least as children progress through school, are due to increases in complexity of reading demands.

Conclusion

The immediate and longer-term effectiveness of full-day kindergarten has been an important area of inquiry. Although most studies find that full-day kindergarten is positively associated with children's reading performance in kindergarten, the effect is not maintained as they progress through elementary school (Votruba-Drzal et al., 2008; Walston et al., 2005). Nevertheless, the majority of kindergartens in the U.S. are becoming full-day (Child Trends Data Bank, 2015). The results from this study provide empirical data to support funding full-day kindergarten programs. Children who attended such programs were more likely to achieve early word reading, which, in turn, was positively associated with their subsequent reading development in elementary school. Full-day kindergarten was also associated with children from low-SES backgrounds becoming comparable to their higher-SES peers in attaining early word reading skills, a skill set shown to be associated with reading performance in elementary school. Although these data are correlational, they are, nevertheless, noteworthy.

It is important to realize, however, that many of the children did not attain early word reading. Thus, it is not just the extra hours in kindergarten that matter, but what is taught and how it is taught needs to be considered. Full-day kindergarten affords an opportunity for teachers to provide relevant reading instruction in a developmentally sensitive manner to all children, and particularly those at risk for reading difficulties. Such a focus is well-aligned with the goals of the Common Core of State Standards (National Governors Association Center for Best Practices, and Council of Chief State School Officers (2010). As states are encouraged to “race to the top” and strengthen children's school readiness in kindergarten, it is important to continue refining our knowledge about the concurrent and long-term benefits of full-day kindergarten programs.

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