RESEARCH ARTICLE

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A Multilevel Analysis of Asian Immigrant Children's Reading Achievement in the Early Years: Evidence from the ECLS-K Data

Abstract   This study investigates 1.5 generation[1] Asian immigrant children's ($n = 264$) early literacy achievement patterns, treating them as a heterogeneous group. Specifically, the within-group variances in reading achievement from kindergarten to third grade are examined, drawing on four waves of data from the ECLS-K class of 1998–1999. Our analysis shows that ethnicity plays a role in shaping the children's initial reading readiness and later growth, but the effects of languages spoken at home are not significant. Our analysis also demonstrates a persistent achievement gap between low- and high-socioeconomic status (SES) Asian groups. However, gender difference in terms of children's reading development is not found to be significant. There is also no interaction between SES and the other factors such as gender, ethnicity and language backgrounds.

Keywords   Asian immigrant children, early reading achievement, multilevel analysis

Introduction

Asians, now outpacing Hispanics, have become the largest stream of new

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[1] 1.5 generation is a term used to describe people who arrive in the US as children and adolescents. Specifically it refers to immigrants who arrive in the US under 10 years of age (Ellis & White, 2006).

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immigrants coming to the US annually (Pew Research Center, 2012). As of 2010, the nation's Asian American population had surpassed 18.2 million, or 5.8 percent of the total US population (Pew Research Center, 2012). Among this group, nearly three-quarters (74%) of the adults were born abroad. In terms of school-age children, in 2006 it was reported that there were 2,282,149 Asian students in U.S. schools, comprising 5% of the total school population (Gebeloff, Evans, & Scheinkman, 2012). Similar to other ethnic minority groups, such as the Hispanics, the Asian American population consists of many subgroups with distinctly different ethnic backgrounds (Pew Research Center, 2012). The major groups are: (a) East Asians (i.e., Chinese, Japanese, Korean); (b) Pacific Islanders (i.e., Fijian, Guamanian, Hawaiian, Marshall Islander, Melanesian, Samoan, Tahitian, Tongan); (c) Southeast Asians (i.e., Cambodian/Kampuchean, Hmong, Indonesian, Lao, Malayan, Thai, Vietnamese); and (d) South Asians (i.e., Bangladeshi, Filipino, Burmese, Asian Indian, Nepali, Pakistani, Sri Lankan; Min, 2006).

However, due to the common monolithic view of Asians as high achievers, research on Asian American students has failed to address the vast ethnic diversity and educational inequity in achievement among and within different Asian subgroups (Li & Wang, 2012; Ng & Lee, 2007; Ng, Lee, & Pak, 2007). In general, Asian students have not been considered to be part of the national literacy crisis due to their high achievements in math and reading as a group. Existing research on Asian immigrant students in general has focused on reporting and explaining the Asian, especially East Asian, success story, treating them as a single, undifferentiated homogenous group, especially at the secondary and post-secondary level (Kao & Thompson, 2003; Sakamoto, Goyette, & Kim, 2009; Teranishi, 2010). However, there is growing evidence of great diversity in academic achievement among different ethnic groups of the Asian American population. For example, recent analysis of Asian American students' performance on the Scholastic Aptitude Test (SAT) revealed a bimodal distribution in scores that is correlated with a high degree of heterogeneity within the population with regard to ethnicity and immigration histories, educational attainment and poverty rates, and a wide distribution in language backgrounds (Teranishi, 2010).

Much research on Asian children's academic achievement has focused on older learners, and it is not clear whether the patterns and findings of studies on

older Asian children also existed in their early learning. At the elementary level, a few studies have included Asians of all language/ethnic backgrounds together as a third comparison group to illustrate Hispanic-white or black-white achievement gaps at the starting gate or later (e.g., Fryer & Levitt, 2004; Lee & Burkam, 2002; Ready, LoGerfo, Burkam, & Lee, 2005; Reardon & Galindo, 2009; Roberts, Mohammed, & Vaughn, 2010). Since few studies have examined subgroup Asian immigrant children's early literacy development patterns, we know very little about their early development patterns and what factors affect their early literacy development. The few studies on Asian subgroups' early literacy tend to focus on East Asians, for example, Chinese immigrant children's home literacy environment of (Li, 2001), Chinese mainland and Hong Kong immigrant students' parental involvement and home-school literacy connections (Li, 2006), or East Asian children's cognitive advantages (Sun, 2011). In this study, we aim to address this gap by describing the foreign born or 1.5 generation Asian immigrant children's early literacy achievement patterns, treating them as a heterogeneous group with diverse cultural, linguistic and socioeconomic backgrounds. Specifically we address the following research questions:

1. What are the 1.5 generation Asian immigrant children's early reading development patterns from kindergarten to third grade?

2. How do the factors of SES, gender, ethnicity, and language background interact to influence the children's early reading development?

3. Do the three subgroup Asian children from different demographic backgrounds (e.g., SES, gender, ethnicity, and language background) differ in their reading growth rate from kindergarten to third grade?

Literature Review

Children's early reading development has been a major area of research over the past few decades. Early reading success has been considered one of the most important predictors of later reading outcomes and school success (National Early Literacy Panel, 2008; Lesnick, George, Smithball, & Gwynne, 2010; Sparks, Patton, & Murdoch, 2013). Research on minority children's early reading development has identified several socioeconomic, sociocultural, and sociolinguistic factors that play an important role in impacting minority children's early literacy development.

Family socioeconomic status (SES) has been found to be the strongest determinant of early reading achievement among Hispanic and black groups (Fryer & Levitt, 2004, 2006; Reardon & Galindo, 2009; Rothstein, 2004). High-SES children are found to have higher performance in reading than their low-SES counterparts across all ethnic groups, due to a variety of factors (see Lee & Burkam, 2002). SES has been found to predict decoding skills, reading comprehension, print knowledge (Hecht et al., 2000), vocabulary (Hart & Risley, 1995), phonological awareness (Noble, Farah, & McCandliss, 2006), volume of reading (Sparks et al., 2013), and parent-child reading engagement (Fletcher, 2013).

Race and ethnicity are other important factors in influencing minority children's early reading achievement. Research has found that Hispanic and black kindergarteners in the U.S. score significantly lower on math and reading tests than their White and Asian peers as they start school (Haskins & Rouse, 2005; Lee & Burkam, 2002; Ready & Tindal, 2006) and these racial/ethnic achievement gaps continue from the start of kindergarten through third grade (National Center for Education Statistics, 2004a; Rumberger & Anguiano, 2009). In fact, in their review of studies on minority early literacy achievement, Garcia, Jensen, and Cuella (2006) concluded that the educational achievement patterns, especially those of early literacy achievement, of virtually all racial/ethnic groups are established during the early years of school and change little thereafter. Reardon and Galindo (2009), for example, in their descriptive analysis of 2,600 Hispanic students from the Early Childhood Longitudinal Study (ECLS-K) data, found that the gaps in math and reading skills between Hispanic and non-Hispanic White students narrowed by roughly a third in the first two years of schooling but remained relatively stable for the next four years. Although the general patterns of early reading achievement among minority groups remain stable, researchers have found vast variation in achievement gaps among Hispanic subgroups. Reardon and Galindo (2009) found that within the Hispanic population, students with Mexican and Central American origins—particularly first- and second-generation immigrants—and those from homes where English is not spoken had the lowest math and reading skill levels at kindergarten entry, but showed the greatest achievement gains in the early years of schooling.

Another significant factor is gender (Chatterji, 2006; Entwisle, Alexander, & Olson, 2007). For example, Ready et al. (2005) in their multiple regression

analyses of 8,701 boys and 8,182 girls from the ECLS-K sample, which included children from diverse backgrounds, found that girls entered kindergarten with somewhat stronger literacy skills, but they also learned slightly more than boys over the kindergarten year. A similar female advantage was also observed by Below, Skinner, Fearrington, and Sorrell (2010) in their six-year longitudinal study of 473 K-5 students, also from diverse backgrounds, in an urban school district in the US. They found that girls scored significantly higher on all four kindergarten pre-literacy skills: initial sound fluency, letter naming fluency, phoneme segmentation fluency, and non-sense word fluency. Girls were also found to adjust better to first grade than boys and therefore had better achievement in literacy than boys in the early years (Ponitz, Rimm-Kaufman, & Brock, 2009). However, the question as to whether or not the female advantage in literacy grows over time is inconclusive. While some research found that these differences between boys and girls grow larger as students progress through school (e.g., Camarata & Woodcock, 2006; Chatterji, 2006), others, such as Below et al.'s study (2010), failed to support those researchers who found that gender differences in early literacy skill development grow larger over time.

Other factors such as home language background also play important roles in predicting early literacy achievement, especially for language minority groups such as Hispanics. Reardon and Galindo (2009), for example, found considerable heterogeneity among Hispanic national origin groups in the magnitude of achievement disparities in both reading and math from kindergarten to fifth grade. Further, they found that what language students spoke at home also mattered. In particular, they found that students from homes where Spanish was the only language spoken achieved rapid gains in kindergarten and first grade, even though they entered kindergarten with lower math and reading skills than those of students from homes where English was the dominant language.

Research on minority children's early literacy development has also identified distinct development patterns in early reading achievement for different ethnic groups. Also using the ECLS data, Roberts et al. (2010) studied normative reading trajectories for native Spanish speakers ($n = 736$), native speakers of Asian languages ($n = 464$; those who identified as Asian without greater specification for Asian sub-groups), and English native speakers ($n = 10,812$) attending U.S. public elementary schools. Their analysis using multilevel latent variable growth modeling showed that the achievement trends of students of Asian-language

background were more similar to those of native English speakers than to those of Spanish speakers. Spanish speakers had lower initial reading achievement than both learners with Asian-language background and native English speakers, and Asian students had higher initial achievement than did the native English speaking group. Additionally, Spanish English language learners (ELLs) had statistically significantly less growth over time than did Asian ELLs. The patterns of achievement gaps have also been found to differ across different minority ethnic groups, especially among Hispanics and blacks. For example, while the gaps between the black-white reading achievements widen in early years (Fryer & Levitt; 2004; Rippeyoung, 2009; Roscigno, 2000), the gaps between Hispanics and Whites in reading narrow somewhat as children progress through elementary school, especially in the first two years of schooling, although gains have also been noted in the fifth grade and beyond (Fryer & Levitt, 2006; Reardon & Galindo, 2009).

Given the growing diversity among Asian subgroups, it is also not clear whether Asian immigrant students' early literacy development patterns are similar to those of other ethnic minority groups, or whether the factors that affect early literacy development of other ethnic groups (such as the Hispanics and the blacks) are also significant in shaping Asian children's early learning across different subgroups. As early childhood provides possibly the best window for improving academic trajectories, researchers have explored early reading development and achievement gaps from different perspectives (Garcia, Jensen, & Cuellar, 2006; Yaden, Rowe, MacGillivray, 2000). The different patterns of achievement among different ethnic groups and the varied factors that influence minority children's early literacy trajectory suggest that more research is needed to understand the Asian early development patterns in relation to SES, ethnicity, gender, and language.

Asian students have been seen as academic high achievers in the popular media, and this monolithic view has obscured the diversity and variation in academic attainment and achievement across groups (Li, 2003; Ngo & Lee, 2007). Since most studies of Asian students have centered on older students, there is little understanding of Asian students' literacy development upon their entry into U.S. schools. While studies such as Sun (2011) found that some East-Asian American infants accumulated greater cognitive advantages than their peers in all other non-European American groups, beginning at the age of nine

months and carried over in their math and literacy achievement at the age of four, it is not clear whether these advantages hold true for other Asian sub-groups as they enter U.S. schools, especially given the diversity that exists across the different subgroups and within certain sub-groups, such as the Southeast Asians (Ngo & Lee, 2007). This study fills the gap in the literature by examining the early literacy development patterns of the 1.5 and second generation Asian children across and within different Asian subgroups by taking into consideration factors such as SES, ethnicity, gender, and home language use.

Data and Methods

Data for the present study was drawn from the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) conducted by the National Center for Education Statistics (2004b). The study followed the same group of children from kindergarten to the eighth grade, measuring their growing trajectories in math and reading achievement. The National Center for Education Statistics used a multi-stage probability sampling design to select a cohort of children that was nationally representative of students who entered kindergarten in the year from 1998 to 1999. Four waves of children's reading scores were chosen for this study: Fall, 1998 (K-BEGIN); Spring 1999 (K-END); Spring 2000 (GRADE 1); and Spring 2002 (GRADE 3). The reading assessment was designed to measure children's basic literacy skills (i.e., print familiarity, letter recognition, rhyming sounds, receptive vocabulary) at the kindergarten and first grade level, and more advanced reading skills (i.e., phonemic awareness, single word decoding and passage comprehension) at the second and third grades. The passage reading section examined sentence, paragraph, and story comprehension with a variety of literary genres including poetry, letters, informational text, and narrative text (National Center for Education Statistics, 2004b). Item Response Theory (IRT) procedures were carried out to calculate scaled scores. IRT made it possible to place each child on a continuous ability scale. With a set of common items linked between different test forms and across grades, IRT scoring makes possible longitudinal measurement of children's achievement gain over time, even though the tests are not administered at identical times.

   The present study was conducted with a sample of 264 Asian immigrant children participating in ECLS-K who met the following criterion: the children

were born in a foreign country and their mother was also from a foreign-born country; these children thus were referred to as the 1.5 generation (see Table 1 for countries of origin). The sample included 142 girls and 122 boys; 172 of them were from a high-SES group and 92 were from a low-SES group. They were also classified into three major regional groups: East Asians ($n = 61$), South Asians ($n = 62$), and Southeast Asians ($n = 141$). The primary language use variable was placed into two major groups: bilingual primarily L1 (heritage language; $n = 162$), and bilingual primarily L2 (English; $n = 102$). If there was a language other than English spoken at home, and the children's primary language was not English, the primary language use was coded as bilingual primarily L1. If the children's primary language was English and there is a language other than English spoken at home, the primary language use was coded as bilingual primarily L2. For different socioeconomic, sociocultural and sociolinguistic factors, a set of standard demographic controls such as the child's gender, ethnicity and SES was included. The SES variable was computed from five measures, namely father's education, mother's education, father's occupation, mother's occupation, and household income. Each of the five measures was collected at the household level with the data being collected from the parents who completed the parent interview in the base year of 1998–1999. The SES composite is the average of these five measures, which were all standardized to have a mean of 0 and a standard deviation of 1. For households with only one parent present, the SES was computed averaging the available components. The households were grouped into low SES category if their composite SES score is below the median among all families and high SES if above the median.

Table 1 Country of Origin (by Mothers' Origin; $n = 264$)

No.	Category	Total	Country/Region
1	South Asian	2	Afghanistan
2	South Asian	1	Bangladesh
3	South Asian	48	India
4	South Asian	7	Pakistan
5	South Asian	1	Nepal
6	South Asian	3	Sri Lanka
7	East Asian	8	Hong Kong
8	East Asian	5	Japan

(*To be continued*)

No.	Category	Total	Country/Region
9	East Asian	2	North Korea
10	East Asian	17	South Korea
11	East Asian	12	Taiwan
12	East Asian	17	Chinese mainland
13	Southeast Asian	3	Indonesia
14	Southeast Asian	26	Laos
15	Southeast Asian	2	Malaysia
16	Southeast Asian	68	Philippines
17	Southeast Asian	2	Singapore
18	Southeast Asian	5	Thailand
19	Southeast Asian	8	Cambodia
20	Southeast Asian	27	Vietnam
	Total	264	

Data Analysis

Multilevel analyses were conducted to understand the 1.5 generation Asian children's early literacy development patterns. First, descriptive statistical analyses of the means and standard deviations of all children's reading scores at the four waves of tests outlined above were calculated. A repeated measure Analysis of Variance (ANOVA) was also conducted to understand the general patterns of children's literacy development and its interactions with different predictors such as SES, ethnicity, gender, and home language use.

Second, a two-level hierarchical linear model (HLM) with measures nested within students was used to understand the variation of their reading scores over time (Raudenbush & Bryk, 2002). The multilevel data allowed the authors to examine whether group-specific level-1 parameters varied across groups or group characteristics (Raudenbush & Bryk, 2002). Three models were applied in HLM: an unconditional means model (Model 1), an unconditional growth model (Model 2) and a full model (Model 3). Model 1 is displayed below:

$$READING\ SCORE_{ti} = \beta_{00} + r_{0i} + e_{ti} \qquad \text{(Model 1)}$$

Model 1 displays the grand mean of children's reading scores across time at level 1, and the grand mean difference across all children at level 2.

Model 2 is shown as:

$$READING\ SCORE_{ti} = \beta_{00} + \beta_{01}*(KBEGIN) + \beta_{10}*(YEAR)$$
$$+ \beta_{11}*(KBEGIN)*(YEAR) + r_{0i} + r_{1i}*(YEAR) + e_{ti}\ (Model\ 2)$$

Model 2 addresses the question of how children's reading ability varied over time (Time 0, Time 1, Time 2 and Time 3) at level 1, and the question of how children's reading and growth rates varied across children over time after controlling for their initial reading achievement at the beginning of kindergarten. Model 3 extends from Model 2 by adding the predictors of SES, Gender, Ethnicity, and Language Spoken at Home at level 2, and addresses the question of how children's reading scores varied over time at level 1, and the question of how children's reading and growth rates varied across children over time as well as how they varied as a function of these several predictors.

Results

The goal of this study was to understand the 1.5 generation Asian immigrant children's early literacy achievement patterns, treating them as a heterogeneous group with diverse cultural, linguistic, and socioeconomic backgrounds. In the following, the authors report our findings in relation to the three research questions for the study.

Asian Immigrant Children's Early Reading Development Patterns

To understand this question, the means and standard deviations of children's reading scores were calculated (Table 2), and repeated measures ANOVA were conducted. Mauchly's test indicated that the assumption of sphericity was violated, $x^2(5) = 11.66$, $p = .003$, therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .96$). The results showed that the Asian children's reading scores from the end of kindergarten to the end of third grade were significantly different from each other, after controlling for their initial reading achievement, $F(1,912) = 1,437.73$, $p < .001$, and the effect size is .85. As Fig. 1 shows, the 1.5 generation Asian children's reading abilities kept growing over time, and the reading trajectory was almost in a linear shape. Further, our analyses revealed that children with higher initial reading achievements upon entering into the kindergarten had a significantly higher reading growth rate than those with lower reading scores ($p < .001$).

Table 2   Means and Standard Deviations of Children's Reading Scores at Four Waves of Time

Wave	Asian	
	N	M (SD)
Time 0 (K-BEGIN)	264	42.09 (1.44)
Time 1 (K-END)	264	56.32 (1.74)
Time 2 (GRADE 1)	264	91.91 (2.12)
Time 3 (GRADE 3)	264	42.09 (1.44)
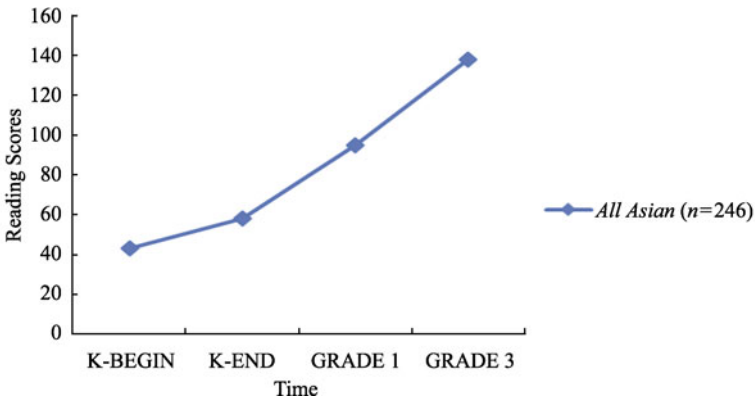
Fig. 1   Trajectory of All Asian Children's Reading Achievement over Time

The Interaction Effects between Early Reading and SES, Gender, Ethnicity, and Language Backgrounds

Interestingly, no interaction between reading achievement and the different factors of SES, gender, ethnicity, and home language use was detected. The results of our repeated measures ANOVA revealed that differences in Asian boys' and girls' reading scores from the end of kindergarten to the end of third grade were not statistically significant, after controlling for their initial reading achievement: $F(2, 239) = 0.66$, $p > .05$ (see Fig. 2). Similarly, although high-SES groups outperformed their low-SES peers over time, the difference was not statistically significant: $F(2, 239) = 2.24$, $p > .05$. (see Fig. 3). Further, among the three subgroups, East Asians performed higher than the South and Southeast Asian groups; however, the differences in their reading scores from the end of kindergarten to the end of third grade were not statistically significant, after

controlling for their initial reading achievement: $F(2, 239) = 0.19$, $p > .05$. The reverse is also true: while Southeast Asians performed lower than the other two groups, their children's reading scores from the end of kindergarten to the end of third grade were not significantly lower than the East Asian and the South Asian children, after controlling for their initial reading achievement: $F(2, 239) = 1.42$, $p > .05$ (Fig. 4). Finally, Asian children who spoke primarily L2 at home outperformed their peers who spoke primarily L1 at home, but the difference was not significant, after controlling for their initial reading achievement: $F(2, 239) = 0.78$, $p > .05$ (Fig. 5).
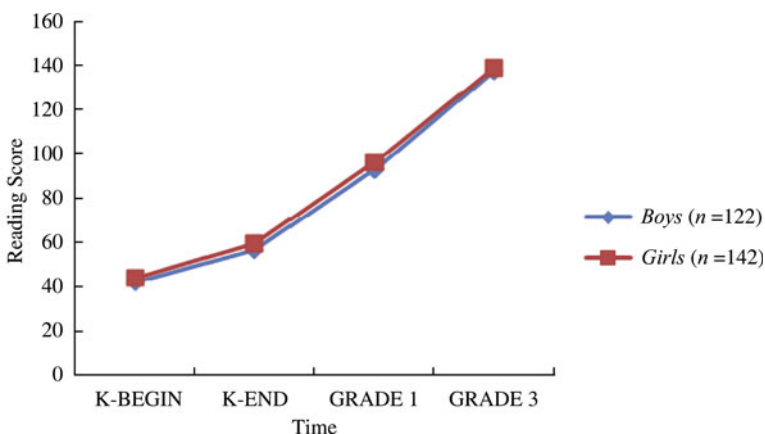

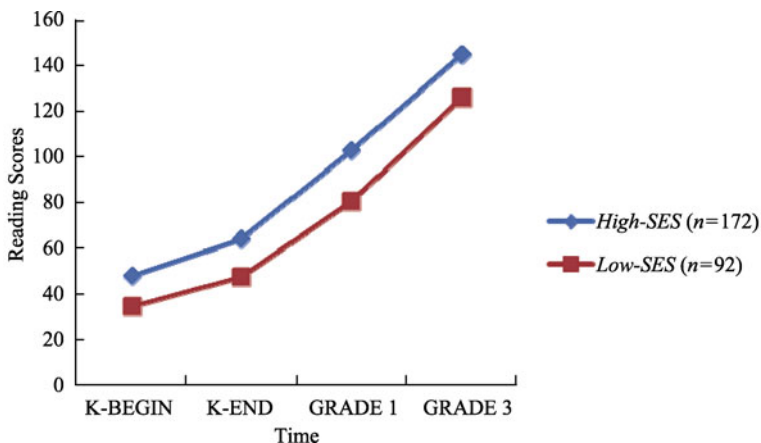**Fig. 2** Trajectory of Asian Children's Reading Achievement over Time by Gender

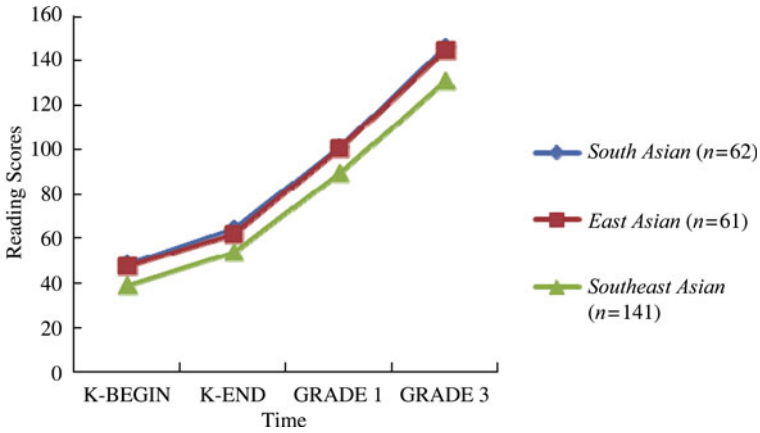**Fig. 3** Trajectory of Asian Children's Reading Achievement over Time by SES

Fig. 4   Trajectory of Asian Children's Reading Achievement over Time by Ethnicity
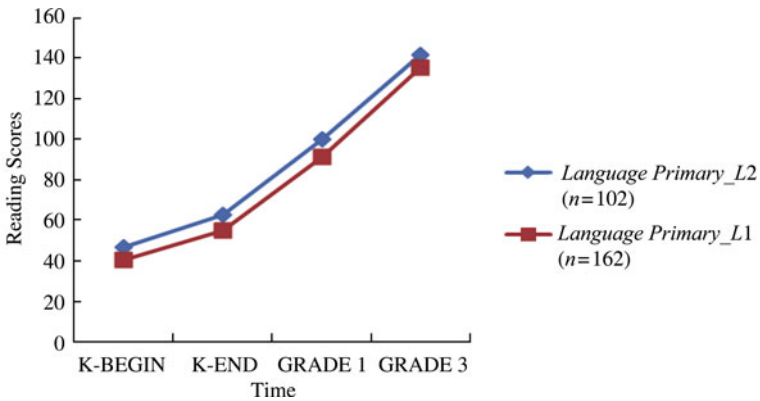

Fig. 5   Trajectory of Asian Children's Reading Achievement over Time by Home Language Use

The results from the repeated measures ANOVA also indicate that no significant interaction effect was found between reading and the four factors of SES, gender, ethnicity, and language altogether: $F(36, 478) = 0.78$, $p > .05$. Since no significant interaction effects were discovered between reading achievement and the four predictors (SES, gender, ethnicity, and language use), the interaction terms between these factors were not included in the final HLM models. The main effects associated with SES, gender, ethnicity, and home language use were directly examined in the HLM fitted model, which is reported below.

Variations in Reading Growth Rate

In order to understand the question of how children's reading scores varied over

time, and how children's reading and growth rates varied across children over time, as well as how they varied as a function of the several predictors (i.e., SES, gender, ethnicity, and language spoken at home) the authors applied three models in HLM. The degree of model data fit could be identified through random effect results. As Table 3 shows, the level 1 variance component is quite large in Model 1 (1,654.44). Comparatively speaking, in Model 2, about 92.94% level 1 variance was explained after adding the predictor "YEAR." The Likelihood Ratio test (1674.20*) between Model 1 and Model 2 also indicates that the addition of this level 1 predictor explained a significant amount of variance, and Model 2 had a better fit than Model 1. In other words, the application of the growth model is appropriate to account for the difference between children's reading achievement over time. As shown in Model 2, the intraclass correlation (ICC) is .1985, which is larger than .138 as specified by Cohen (1988) for non-ignorable between-group effect at higher levels in hierarchical linear models. The level 2 variance for slope (r_{1i}) is also significant ($p < .001$), showing the same tendency. After more predictors at level 2 (i.e., SES, gender, ethnicity, and language) were added in Model 3, the ICC was also larger than the critical value in Cohen (1988). The Likelihood Ratio test result (54.44*) also indicates that Model 3 had a better fit than Model 2. Thus, the full model with the addition of level 1 and level 2 predictors is the most fitting model among the three models attempted.

Table 3 Comparison of the Output from the Three Models

Fixed Effect	Model 1			Model 2			Model 3		
	Coeff.	*Se.*	*p*	*Coeff.*	*Se.*	*p*	*Coeff.*	*Se.*	*p*
For INTRCPT1, π_{0i}									
INTRCPT2, β_{00}	96.82**	1.36	< .000	–38.35**	2.72	<.001	–41.96**	3.97	<.001
SES, β_{01}							0.55	2.06	.79
KBEGIN, β_{02}				1.29**	0.07	< .001	1.32**	0.07	< .001
GENDER, β_{03}							–1.22	1.90	.52
EASIAN, β_{04}							1.55	3.11	.62
SEASIAN, β_{05}							–4.90	2.58	.06
LANGUAGE, β_{06}							0.94	2.06	.65
For YEAR slope, π_{1i}									
INTRCPT2, β_{10}				46.46**	1.49	< .001	48.24**	2.11	<.001

(*To be continued*)

Fixed Effect	Model 1			Model 2			Model 3		
	Coeff.	*Se.*	*p*	*Coeff.*	*Se.*	*p*	*Coeff.*	*Se.*	*p*
SES, β_{11}							2.99[*]	1.21	.01
KBEGIN, β_{12}				0.15[**]	0.03	< .001	0.21[**]	0.03	<.001
GENDER, β_{13}							0.29	1.07	.79
EASIAN, β_{14}							0.82	1.66	.62
SEASIAN, β_{15}							–3.42[*]	1.44	.02
LANGUAGE, β_{16}							0.20	1.13	.86
Random Effect (Variance component)									
INTRCPT1, r_{0i}	2.61	1.62	> .500	0.85	0.92	> .500	2.15	1.47	> .500
YEAR slope, r_{1i}				28.08[**]	5.30	< .001	26.01[**]	5.10	< .001
Level-1, e_{ti}	1,654.44	40.67		116.84	10.81		115.77	10.76	
Deviance		8,112.97			6,438.77			6384.33	
Itraclass Correlation (ICC)				0.1985			0.1957		
Likelihood ratio test				1674.20[*]			54.44*		

Note. SES = High vs low family social economic status; K-BEGIN = the beginning of kindergarten; LANGUAGE = Bilingual Primary L2 vs Bilingual Primary L1; EASIAN = East Asian vs other Asian; SEASIAN = Southeast Asian vs other Asian Children. [**]$p < 0.001$, [*]$p <. 05$

The results of the HLM analyses indicate that there existed significant differences in reading achievement among the Asian subgroups over time. For the fixed effects, as Table 3 shows, the estimates for KBEGIN (β_{12}) are all significant in Model 2 and Model 3, indicating that children with higher initial reading achievements upon entering kindergarten had a significantly higher reading growth rate than those with lower reading scores ($p < .001$). In terms of SES status (β_{11}), as Model 3 displays, Asian immigrant children with high-SES had a significantly higher reading growth rate than low-SES children ($p < .05$). Although children with higher SES status (β_{01}) had higher initial reading achievement than their low SES counterparts, the difference was not significant ($p > .05$).

With regard to ethnicity, the results revealed that Southeast Asian immigrant children' initial reading achievement (β_{05}) was lower than the other groups, but the differences were not statistically significant ($p > .05$). However, their reading growth rates (β_{15}) were significantly lower than the other Asian groups across all

waves ($p < .05$). With regard to gender, no significant difference in terms of initial reading achievement (β_{03}), as well as the reading growth rate (β_{13}), was identified ($p > .05$). Similarly, the data revealed that the mean reading achievements of children who were bilingual speaking primarily L1, or bilingual speaking primarily L2, were not significantly different from each other ($p > .05$). Furthermore, what languages they spoke at home did not make any difference to their reading growth rate ($p > .05$).

Discussion

Along with the existing body of research on Hispanic and black children's early literacy development, the findings of this study contribute to our understanding of minority children's early learning trajectories. Several important findings emerged. First, different from previous findings on Hispanic and black children's early development patterns that were not linear (Fryer & Levitt, 2004, 2006; Reardon & Galindo, 2009), our analysis suggests that as a group, Asian children's early achievement grows steadily from kindergarten to third grade in a linear fashion. However, consistent with previous studies on early reading development, our analyses also show that higher initial reading achievements lead to higher reading growth over time (Ready & Tindal, 2006; Schatschneider et at., 2004; Snow, Burns, & Griffin, 1998).

Second, similar to findings on other minority groups (Hernandez & Macartney, 2008; Magnuson, Meyers, Ruhm, & Waldfogel, 2004), family SES and ethnicity play an important role in mediating Asian immigrant children's early achievement. The analyses show that high-SES Asian immigrant children had significantly higher initial reading scores and a significantly higher reading growth rate than low-SES Asian children. Although not significant, it is shown that across the Asian subgroups, high-SES boys and girls had higher initial reading scores and exhibited a higher growth rate than their low-SES counterparts. Similarly, even within sub-Asian groups, such as Southeast Asians, high-SES children had higher initial reading scores and higher growth rate over time than their low-SES counterparts. Finally, although the interaction between the SES and the home language use factor was not significant, our analyses do reveal that high-SES children from either L1 or L2 home language background had higher initial reading scores and growth rate than those from low-SES

backgrounds. These findings are consistent with previous research that family SES is a strong mediator of children's literacy and academic achievement (Ngo & Lee, 2007; Portes & Rumbaut, 1996). The findings support the call to address the impact of poverty on minority children's early literacy learning.

Third, consistent with previous research on variations among the Asian subgroups (Li, 2009; Lee, 2011; Teranishi, 2010), the authors found vast ethnic differences in early literacy achievement and growth over time. Among the three major subgroups, Southeast Asian immigrant children's initial reading scores and their reading growth were significantly lower than South Asian and East Asian groups who had similar achievement patterns across all waves. These findings suggest that in addition to the structural SES factor mentioned above, research also needs to examine the relationship between sub-ethnic cultural differences and early literacy development. Further, research also needs to examine the relationship between structure (SES) and sub-ethnic cultures and how they interact to shape different early literacy development patterns across different sub-ethnic groups (Ngo & Lee, 2007; Zhou & Kim, 2006).

Fourth, different from previous research (Below et al., 2010; Chatterji, 2006; Entwisle et al., 2007; Ready et al., 2005) which found significant gender differences in early literacy development, gender was not found to play an important role in mediating Asian immigrant children's early achievement from kindergarten through third grade. The lack of gender differences among the Asian immigrant children may be the result of interactional factors between school and home. For example, previous research (e.g., Below et al., 2010; Chatterji, 2006) finds that American school teachers' higher expectations for females than for males contribute to the female advantage in early literacy achievement. If this holds true for Asian children, the lack of differences between Asian immigrant boys and girls in early literacy achievement may be attributed to pan-Asian cultural values on early literacy development, especially for boys. That is, pan-Asian cultural emphasis on boys' early literacy development may have evened out the female advantage in early literacy found among children of other ethnic backgrounds in other studies. Future research may further examine the effects of gender, both across different ethnic groups (e.g., black, white, Hispanic and Asians) and across different Asian subgroups, to understand better how culture and environment (e.g., classroom and school) influences gendered early literacy development.

Finally, another surprising finding of this analysis is related to the effects of language use at home on Asian children's early literacy development. Our analyses suggest that while students who speak primarily L2 scored slightly higher than those who speak primarily L1, there was no significant difference in their initial reading scores or their reading growth in relation to the children's language use at home, whether they primarily speak English or their mother tongue at home. The findings may suggest that positive transfer between L1 and L2 may have contributed to the Asian children's overall early literacy skills, and that first language exposure greatly facilitates second language English learning (Goldenberg, 2010; Lesaux, Koda, Siegel, & Shanahan, 2006; Pearson, Fernandez, Lewedag, & Oller, 1997; Verhoeven, 2011). Further studies on L1 and L2 literacy transfer will provide important insights into Asian children's early literacy development patterns.

Conclusions

In this study, the authors have tried to unpack Asian subgroups' early literacy development patterns by examining the relationship between factors such as SES, gender, language and ethnicity and their early reading growth from kindergarten to third grade. Different from previous studies that found typical associations and intersections among these factors, there is a variation in patterns of association among these factors. This study finds that while the overall patterns of growth are linear among Asian subgroups, significant differences in reading growth are found to be associated with SES and ethnicity factors but not with gender and language background factors. The SES and ethnicity differences in early literacy achievement counter some of the "model minority" claims that all Asians are high academic achiever regardless of SES backgrounds (Li & Wang, 2012; Ng et al., 2007). The authors' findings suggest that not all Asian children, especially those from Southeast Asian backgrounds, will accumulate cognitive or academic advantages from early on. The lack of association between gender and early literacy development also suggests further studies on how culturally different belief systems on gender in school and home may work together to imprint a different early literacy development patterns among Asian children. As well, lack of difference in reading growth between children of different home language backgrounds further suggests a need to reexamine current language education

policies and practices that increasingly discount the importance of L1 acquisition in their English (L2) and academic achievement. Finally, the variation in the association patterns among the different factors calls for careful theoretical and methodological reconsiderations about the "intersectionality" of SES, race, gender, and language factors in understanding minority literacy achievement (McCall, 2005). As this study suggests, these factors do not always jointly or simultaneously influence minority literacy development in the same fashion. Therefore, a more comprehensive analysis of Asian as a heterogamous group (and other minority groups) may require an expansion of the current analytical framework to include more sociocultural dimensions and categories of analysis and more diverse methods of research that include both qualitative and quantitative research.

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