



Longitudinal effects of socioeconomic status on first and second language reading development: evidence from Chinese children learning English

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Abstract

While it has been shown that socioeconomic status (SES) is important for children's literacy development in their first language (L1), less is known about its association with reading in a second language (L2). The present study examined the different effects of SES on the acquisition of reading in Chinese as L1 and English as L2 from ages 7 to 11, among 291 Chinese children. The results showed that the contribution of SES to Chinese word reading was not significant. In contrast, SES significantly predicted English word reading. Mediation analyses revealed that SES had direct and indirect effects on English word reading, through phonological awareness and letter name knowledge, but only an indirect effect on Chinese word reading through phonological awareness and vocabulary knowledge. These findings highlight the importance of SES for reading acquisition in L2, and the influence of language-specific characteristics on the cognitive/linguistic skills required to master reading in a specific language.

Keywords SES · Chinese · English · Reading · Longitudinal

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Introduction

In recent decades, studies have shown that SES has a significant impact on children's reading accuracy and comprehension in alphabetic languages as well as in Chinese (Cheng & Wu, 2017; Hart et al., 2013; Noble et al., 2006). Compared to the role of SES in children's reading ability in their first language (L1), less is known about how it influences reading development, especially in the later stage of development, and in their second language (L2, for a review, see Liu et al., 2016). The present longitudinal study aimed to investigate these issues by looking at children learning two languages (i.e., Chinese, which is generally considered as a logographic script, as their L1 and English, an alphabetic script, as their L2). These two languages have substantial differences, such as orthography-phonology correspondence and morphological structure.

Previous research has identified a number of cognitive and language skills, including phonological awareness, orthographic awareness, rapid naming, morphological awareness, and vocabulary knowledge, as important predictors of literacy development in both alphabetic and logographic scripts such as Chinese (e.g., Lervåg & Aukrust, 2010; Lyytinen et al., 2006; McBride-Chang et al., 2012; Nagy et al., 2003; Shu et al., 2006). Besides the abovementioned variables, SES has been shown to predict reading performance in different languages (Noble et al., 2006; Su et al., 2017; Zhang et al., 2013). SES usually refers to parental income, education level, and occupation. Fung and Chung (2020) found that SES predicts both the reading and the writing of Chinese children. Previous studies have shown that children from high SES families show better pre-reading and language skills before receiving formal education than do their peers from low SES families (Hecht et al., 2000; Hoff, 2003; Rowe et al., 2012). It influences home literacy environment and resources, such as toys and books available, neighborhood and school choices (e.g., Liu et al., 2020; Van Steensel, 2006). Teacher quality, friends' influences on literacy attitudes, and even country-level literacy skills are all partly a function of SES at different levels (e.g., Chiu & McBride-Chang, 2006). Previous findings suggest that the influence of SES on children's literacy environment is mediated by other factors such as phonological awareness and vocabulary (Farkas & Beron, 2004; Noble et al., 2006; Zhang et al., 2013).

To our knowledge, most studies have investigated the association between SES and L1 learning (also see Liu et al., 2016 for a review). Only a very small number of studies have investigated how SES affects L2 learning (e.g., Kahn-Horwitz et al., 2006), and these results are inconsistent. For example, Páez et al. (2007) studied 4-year-old Spanish-English children living in the United States and found that SES was equally related to literacy skills in both L1 Spanish and L2 English. However, Bohman and colleagues (2010) found that, among Spanish-English bilinguals, children from higher SES families had better language performances in L2 English whereas children from lower SES families, who were likely recent immigrants to the US, had higher language performances in Spanish.

The above-mentioned studies mostly explored bilingual children speaking two alphabetic languages where their L2 was the official language in their countries of residence. It is less clear how SES contributes to reading development in two very

different scripts (e.g., alphabetic and logographic scripts), especially when L2 is used less commonly than L1. This, nevertheless, is important because, in many societies, it is mandatory for students to learn a L2 which is used less often than the L1. For example, in mainland China, all students have to take one foreign language exam to fulfill the college entrance exam requirement (Ministry of Education of the People's Republic of China, 2023); the majority of them take the English exam (Li et al., 2021), followed by Japanese (about 2% of the total number of students taking the college entrance exam, Xiao et al., 2021).

There has been a few studies conducted in Hong Kong that investigated these issues. For example, Liu and colleagues (2016) found, with kindergartners, that, after statistically controlling for a number of cognitive correlates, SES did not contribute to L1 Chinese word reading but was associated uniquely with L2 English word reading. This relation between SES and English word reading was mediated partially by L1 phonological awareness. Chung et al. (2017) compared low- and middle-SES families and found that kindergartners from these two groups differed only in English word reading but not in Chinese word reading, such that the children from higher SES families manifested better English skills. The weaker association between SES and Chinese, as compared to English, may have been due to the similar literacy instructions given by parents with different SES backgrounds, which could have reduced the differences in their children's learning to read Chinese. In a longitudinal study, McBride-Chang et al. (2012) grouped Hong Kong children from 5 to 9 years old into four groups, based on their word-reading performances: poor in Chinese, poor in English, poor in both, and a control group. They found that the mothers of the children in the 'poor in English' group had lower educational levels than those from other groups, suggesting a stronger influence of SES in L2 English than in L1 Chinese. In studies of various dimensions of Hong Kong Chinese children's literacy skills, fathers' incomes and mothers' education levels were significantly correlated with English writing and spelling but not with Chinese writing or spelling (Li et al., 2012; Zhang et al., 2014). These findings suggest that SES has a stronger association with L2 than with L1 among Chinese children learning English. However, these studies focused mostly on an early stage of literacy development. It is not clear how SES could affect reading achievement at later stages.

Investigating the long-term influence of SES on L2, and the substantial differences from L1, has both theoretical and practical importance. Theoretically, it is known that various environments in the ecological systems affect children's development (Bronfenbrenner, 1995), which includes literacy development (McBride, 2016, p.2). The Family Stress Model (Iruka et al., 2012; Masarik & Conger, 2017) predicts that economic stress in low SES families may lead to a home environment that is unsupportive of social and cognitive development, resulting in more academic problems. In a community where L2 is used less commonly than L1, it is not clear whether SES has the same effect on L1 and L2 learning in the long run. If SES has an extra or more direct influence in the long term, a practical implication is that more training should be given to teachers to provide further support to children from low SES families.

In the present study, we set out to investigate the influence of SES on the L1 Chinese and L2 English word reading of children in mainland China from a longer-term perspective (i.e., 7 to 11 years old), aiming to systematically test the develop-

mental pattern of this influence on L1 and L2 word reading. In addition, we sought to determine the extent to which some cognitive-linguistic skills might mediate the influence of SES on word reading in both L1 and L2. Given that English was not introduced formally in the kindergarten in China, we included phonological awareness and vocabulary knowledge in Chinese as control variables/mediators in both Chinese and English word reading models. Liu et al. (2016) also measured Chinese phonological awareness only, even though the children in their sample had been introduced formally to English. We included English letter name knowledge as an additional measure of English print knowledge, which has been shown to predict subsequent literacy skills (e.g., Evans et al., 2006). Previous work showed that SES did not contribute directly to mainland Chinese children's reading, and that phonological awareness, vocabulary knowledge, and morphological awareness fully mediated the association between SES and L1 reading (Liu et al., 2016; Su et al., 2017). Such an indirect influence was possibly manifested through child-directed speech and vocabulary learning in daily communications. Liu et al. (2016) found that phonological awareness, but not vocabulary, fully mediated the relation between SES and L1 Chinese among Hong Kong children. Based on previous findings, we predicted that, with such cognitive-linguistic skills statistically controlled, SES would still contribute significantly to word reading in English but not in Chinese. We also expected SES to have only indirect effects on Chinese word reading, but direct and indirect effects on English word reading. We hypothesized that a strong and direct relation between SES and L2 English given the support received by children from different SES background. As well, we hypothesized that the weaker and indirect association between SES and mainland Chinese children's L1 would be due to parents from different SES backgrounds providing similar literacy instruction (Chung et al., 2017).

Method

Participants

Two-hundred ninety-one children (129 girls) were selected from those who had initially participated in the Chinese Communicative Development Inventory (Tardif et al., 2008). The original sample of 309 children was recruited from maternal-child health care service centers in Beijing when the children were born (around year 2000). These children came from families with varied SES; the sample was selected to be statistically representative of the city. Therefore, we considered the sample to be reasonably representative of Beijing. All the participants were native Mandarin speakers. According to their health care records, they had normal IQs and they did not any show mental, physical, or sensory difficulties. They were tested approximately once every 12 months, on a number of tasks. The children had a mean age of 4.46 ($SD=0.30$) years at the 4-year old measurement point. We obtained written consent from the participants' parents/guardians. The study was approved by the Institutional Review Board of Beijing Normal University. Eighteen children withdrew from the study across the years. The attrition rate was about 5.8%.

Measures

Nonverbal IQ

We measured the children's nonverbal IQ at age 4, using the first two sets (A and B) in the Raven's Standard Progressive Matrices (Raven et al., 1996). For each item, the children were asked to choose, from six options, the missing element in the figure. There were 12 items in each set, and one point was given for each correct choice.

Phonological awareness

Phonological awareness was measured only in Chinese. The children were given the syllable deletion task (Pan et al., 2016) to measure their phonological awareness at age 5. In this task, the experimenter orally presented a two-syllable or three-syllable phrase, and the children were asked to delete a syllable in the phrase specified by the experimenter (e.g., the correct answer for deleting /hong2/ meaning red from /hong2 yan2 se4/ meaning red color would be /yan2 se4/ which means color). Each correct answer was awarded one point. There were seven two-syllable items and eight three-syllable items, making a total of 15 items.

Vocabulary knowledge

Vocabulary knowledge was measured only in Chinese. A vocabulary definition task (McBride-Chang et al., 2008), with one practice trial and 32 experimental trials, was administered at age 5. The children were presented orally with words that represented concepts or objects, and were required to give oral definitions of these words. The score range for each word varied from 0 (no answer or a clearly wrong answer) to 2 (a clear description of the word). For example, an answer like "a place for cooking" would be allocated two points for the word 厨房 (kitchen), and one point would be given for an answer like "a place at home". The maximum score for this test was 64.

English letter name

The children were given 12 English letters (i.e., a, c, f, g, h, i, k, m, p, s, t, and u) and were asked to name the letters. This task was also administered at age 5. One point was given for each correct answer.

SES

A background questionnaire to determine parents' education levels and income was given to both parents when their children were one year old. We used a 7-point scale to assess the parents' education levels (i.e., 1=primary school grade 3 or below, 2=primary school grade 4–6, 3=junior high school, 4=senior high school, 5=junior college, 6=bachelor's degree, 7=postgraduate degree). Parents' income was assessed using a 6-point scale (i.e., 1=less than 300, 2=between 300 and 499, 3=between 500 and 999, 4=between 1000 and 1999, 5=between 2000 and 8999,

6=more than 9000 Chinese Yuan per month). According to the annual data published by the Beijing Municipal Bureau of Statistics in 2000, the average monthly income was about ¥1,310. We then computed z-scores for each measure and combined these z-scores to form an index of SES (Noble et al., 2006).

Chinese word reading

A Chinese one-character word reading task (Song et al., 2015) was administered at age 5, and ages 7 to 11. At ages 5 and 7, there were 100 words. Fifty new words were added at ages 8 to 11, resulting in 150 words. All words were chosen from primary school textbooks and were expected to be learned by grade 6 in Beijing (Shu et al., 2003). The words were organized in increasing difficulty. The children were asked to name the words. One point was given for each correctly named word.

English word reading

This task was administered at ages 7 to 8 and ages 10 to 11. The English words were chosen from English textbooks. The children were tested on the same 30 words at ages 7 and 8. At age 10, a new set of 40 words was administered. At age 11, there were 25 words and 25 nonwords. Nineteen of the words that were used at ages 10 and 11 overlapped. Words used in each assessment varied in difficulty. Each correctly named word was awarded one point. Given that the test consisted of words only given to ages 7 to 10, to be consistent, scores for age 11 were also based only on words.¹

Results

Table 1 shows the means, standard deviations, maximum scores, and reliabilities of each measure and their correlations. Most tasks were of moderate to high reliability, and all variables were significantly correlated.

We first performed hierarchical regression analyses to test the contribution of SES to Chinese and English word reading. In the first set of models, we included age and nonverbal IQ at age 4 in the first step and SES in the second step. Table 2 shows that, after controlling for age and nonverbal IQ, SES significantly contributed to Chinese word reading at ages 7 to 11, significantly explaining 2.0–3.2% of the variance. These variances were similar to those reported by Fung and Chung (2020). It also significantly explained 4.1–12.4% of variance in English word reading at ages 7 to 8 and 10 to 11. However, when phonological awareness, vocabulary knowledge, and Chinese word reading at age 5 were statistically controlled, SES did not make any significant contributions to Chinese word reading. In contrast, with English letter name knowledge being statistically controlled in addition to other control variables, SES still significantly predicted English word reading at ages 7 to 8 and 10 to 11, explaining 1.1–6.7% of the extra variance (see Table 3).

¹ Results yielded the same pattern of significance when all items (including words and nonwords) at age 11 were included in the analyses.

Table 1 Means, standard deviations, reliabilities of all measures and correlations among them

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 NIQ-4	-														
2 PA-5	0.278	-													
3 VK-5	0.257	0.343	-												
4 LN-5	0.286	0.213	0.226	-											
5 SES	0.255	0.247	0.301	0.236	-										
6 CR-5	0.314	0.427	0.242	0.349	0.186	-									
7 CR-7	0.275	0.435	0.270	0.320	0.205	0.652	-								
8 CR-8	0.230	0.435	0.307	0.316	0.175	0.584	0.884	-							
9 CR-9	0.217	0.437	0.336	0.312	0.191	0.511	0.821	0.921	-						
10 CR-10	0.230	0.476	0.312	0.326	0.188	0.471	0.765	0.870	0.922	-					
11 CR-11	0.189	0.483	0.239	0.286	0.210	0.395	0.715	0.811	0.886	0.926	-				
12 ER-7	0.267	0.351	0.189	0.324	0.252	0.510	0.547	0.469	0.446	0.432	0.404	-			
13 ER-8	0.223	0.398	0.216	0.305	0.369	0.428	0.516	0.456	0.450	0.471	0.463	0.788	-		
14 ER-10	0.223	0.388	0.174	0.302	0.387	0.465	0.528	0.514	0.519	0.543	0.551	0.667	0.757	-	
15 ER-11	0.256	0.401	0.197	0.278	0.383	0.458	0.512	0.510	0.514	0.545	0.558	0.641	0.710	0.896	-
Mean	10.42	12.00	8.08	1.66	0.00	13.96	56.65	89.46	109.18	113.66	123.38	8.68	16.39	15.00	9.19
SD	2.53	3.16	3.95	2.54	2.95	15.99	14.58	19.42	17.47	14.49	12.28	8.54	8.92	9.82	6.23
Reliability	0.55	0.86	0.69	0.90	-	0.98	0.96	0.96	0.96	0.97	0.93	0.96	0.95	0.91	0.94

Note NIQ=Nonverbal IQ, PA=phonological awareness, VK=vocabulary knowledge, LN=English letter name knowledge, CR=Chinese word reading, ER=English word reading. The numbers following the hyphens indicate the ages at which the tasks were administered. All correlations coefficients were statistically significant (all $ps < 0.01$)

Table 2 Hierarchical regression analyses of SES's contribution to Chinese word reading

	Age 7		Age 8		Age 9		Age 10		Age 11	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Model 1										
1. Age	0.140***	0.265***	109***	0.248***	0.081***	0.192***	0.078***	0.165**	0.053***	0.137*
NIQ		0.196***		0.155**		0.160**		0.182**		0.148*
2. SES	0.026**	0.168**	0.020**	0.146*	0.024**	0.162**	0.022**	0.154**	0.032**	0.186**
Model 2										
1. Age	0.135***	0.258***	0.108***	0.245***	0.083***	0.193***	0.078***	0.164**	0.054***	0.135*
NIQ		0.195***		0.157**		0.164**		0.183**		0.154*
2. CR-5	0.339***	0.534***	0.304***	0.457***	0.272***	0.372***	0.258***	0.303***	0.245***	0.217***
PA-5		0.158**		0.186***		0.291***		0.295***		0.359***
VK-5		0.062		0.120*		0.164**		0.125*		0.116*
3. SES	0.002	0.052	0.000	0.019	0.001	0.031	0.001	0.025	0.004	0.065

Note NIQ=Nonverbal IQ, PA = phonological awareness, VK=vocabulary knowledge, CR =Chinese word reading. The numbers following the hyphens indicate the ages at which the tasks were administered. *** = $p < .001$, ** = $p < .01$, * = $p < .05$

We then examined the direct and indirect effects of SES on Chinese and English word reading. Given the results of the regression analyses, we specified phonological awareness and vocabulary knowledge as mediators in the Chinese word reading model, and phonological awareness and English letter name knowledge as mediators in the English word reading model. We averaged the children's Chinese word reading scores across years as their Chinese reading accuracy. For English, given the different numbers of items used in different years, we computed z-scores and averaged these across years as an indicator of English reading performance. The direct models showed that SES predicted both Chinese (Fig. 1a) and English (Fig. 1b) word reading. However, phonological awareness and vocabulary knowledge fully mediated the relationship between SES and Chinese word reading (Fig. 2a), while the relation between SES and English word reading was only partially mediated by phonological awareness and letter name knowledge, and SES directly predicted English word reading (Fig. 2b).

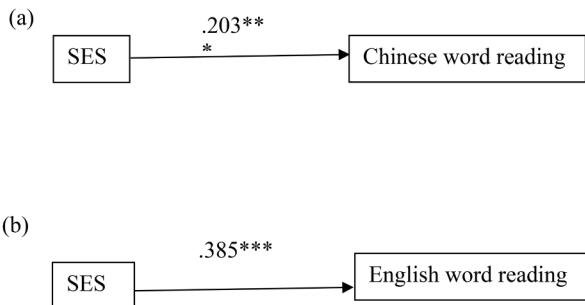
In order to examine the relationship of family SES with the growth of Chinese word reading and their underlying mechanisms, we further conducted latent growth curve analysis to examine the direct and indirect effects of SES on the initial status and the growth of Chinese word reading. We first estimated the growth of Chinese word reading by testing the baseline model (see Fig. 3). To model the respective growth factors, the factor loadings of the initial status were all set as 1 and the factor loadings of linear growth factor were set as 0, 1, 2, 3, and 4. For the quadratic factor, to provide a better estimate of the developmental trend of Chinese word reading, the factor loadings were set as 0, 1, 4, and 9 for the first four measurements, and as a free parameter for the last measurement. The factor loading was 13.35 and was significant ($p < .001$). The model had a good fit to the data with model $\chi^2(7) = 33.12$, $p < .001$, CFI = 0.99, TLI = 0.98, and SRMR = 0.04. The results showed that both linear and quadratic trends were needed to describe the development of Chinese word reading. We then tested the effect of family SES on the developmental trajectories of Chinese word reading (see Fig. 4). The result suggested that the model had a good fit to the data with model $\chi^2(9) = 33.83$, $p < .001$, CFI = 0.99, TLI = 0.98, and SRMR = 0.04 and SES was only associated with initial status of Chinese word reading. Finally, we tested the mediation effects of phonological awareness and vocabulary knowledge by testing the mediated latent growth curve model of Chinese word reading (see Fig. 5). The results showed that the model had a good fit to the data (model $\chi^2(13) = 34.41$, $p < .001$, CFI = 0.99, TLI = 0.98, and SRMR = 0.03). For the initial status, the indirect effects were significant. Phonological awareness and vocabulary knowledge fully mediated the relationship between SES and initial status. The results showed that children with higher SES tended to have higher phonological awareness and better vocabulary knowledge, and hence better Chinese word reading performance at age 7. For the linear and quadratic growth factors, the results revealed that only the indirect effects of SES but not the direct effect of SES on the growth factors were significant, suggested that SES contributed to the growth of Chinese word reading through early linguistic skills. Since the indirect effect was positive on the linear growth factor but was negative on the quadratic growth factor, the results suggested that although children with higher SES developed their Chinese word reading at a faster rate at

Table 3 Hierarchical regression analyses of SES's contribution to English word reading

	Age 7		Age 8		Age 10		Age 11	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Model 3								
1. Age	0.086***	0.126*	0.052***	0.046	0.059***	0.103	0.068***	0.048
NIQ		0.229***		0.209***		0.193***		0.242***
2. SES	0.041***	0.209***	0.108***	0.340***	0.124***	0.365***	0.112***	0.347***
Model 4								
1. Age	0.085***	0.122*	0.051***	0.046	0.055***	0.095	0.067***	0.042
NIQ		0.230***		0.208***		0.189**		0.243***
2.	0.224***	0.379***	0.217***	0.273***	0.221***	0.320***	0.215***	0.318***
CR-5								
PA-5		0.137***		0.240***		0.219***		0.236***
VK-5		-0.002		0.035		-0.017		0.008
LN-5		0.140*		0.147**		0.137*		0.097
3. SES	0.011*	0.115*	0.048***	0.240***	0.067***	0.283***	0.056***	0.260***

Note NIQ=Nonverbal IQ, PA=phonological awareness, VK=vocabulary knowledge, LN=English letter name knowledge, CR=Chinese word reading. The numbers following the hyphens indicate the ages at which the tasks were administered. *** = $p < .001$, ** = $p < .01$, * = $p < .05$

Fig. 1 (a) Direct effect of SES on Chinese reading; (b) Direct effect of SES on English reading. *** $p < .001$



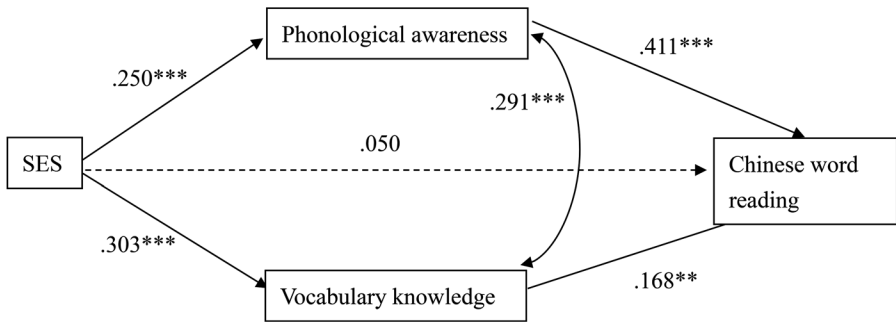
the early stage, the growth slowed down faster at later stage of the development as compared to the lower SES children.

Discussion

The present longitudinal study examined the contributions of SES to word reading in Chinese (L1) and English (L2). We found that it contributed significantly to English word reading development after controlling for literacy-related cognitive/linguistic skills. In contrast, the role of SES in Chinese word reading was not significant when these skills were taken into account. In addition, SES did not contribute to Chinese word reading directly, but phonological awareness and vocabulary knowledge acted as mediators of this relationship, while it had direct and indirect effects on English word reading.

Although there is substantial evidence of the role of SES in literacy development in alphabetic languages, relatively few studies have looked into this association in

(a)



(b)

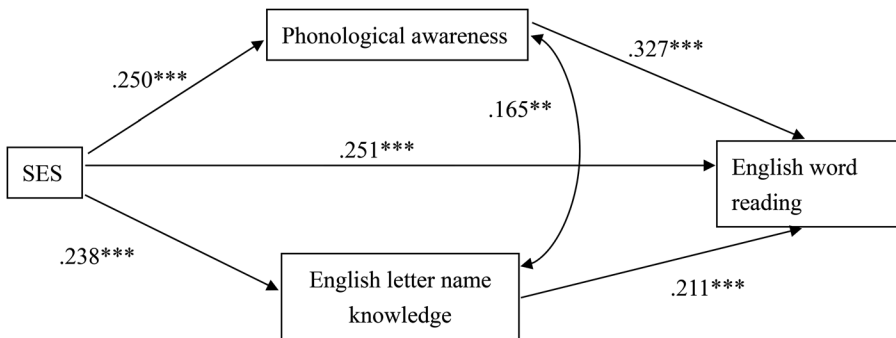


Fig. 2 (a) Mediation effects of early linguistic skills on the relation between SES and Chinese word reading; (b) Mediation effects of phonological awareness and English letter name knowledge on the relation between SES and English word reading. ** $p < .01$, *** $p < .001$

Chinese (for a review, see Liu et al., 2016). In general, our findings that SES had only indirect effects on Chinese word reading, and that, after controlling for early linguistic variables, it did not make a significant contribution to Chinese word reading were consistent with previous research (Liu et al., 2016; Zhang et al., 2014). With the cultural push by Chinese parents for their children to learn to read early, there may be a large reduction in the learning differences in Chinese reading exhibited by children from different family backgrounds. Furthermore, children from different SES backgrounds may receive similar support (Chung et al., 2017). Thus, parents' SES might be less relevant to children's early achievement in Chinese reading than in English reading. In addition, compared to some western countries, Chinese children are introduced to literacy skills earlier than children in western countries learning to read in their own native languages (McBride, 2016, p.16). Chinese children therefore receive early support from their formal education, and SES may be less influential in

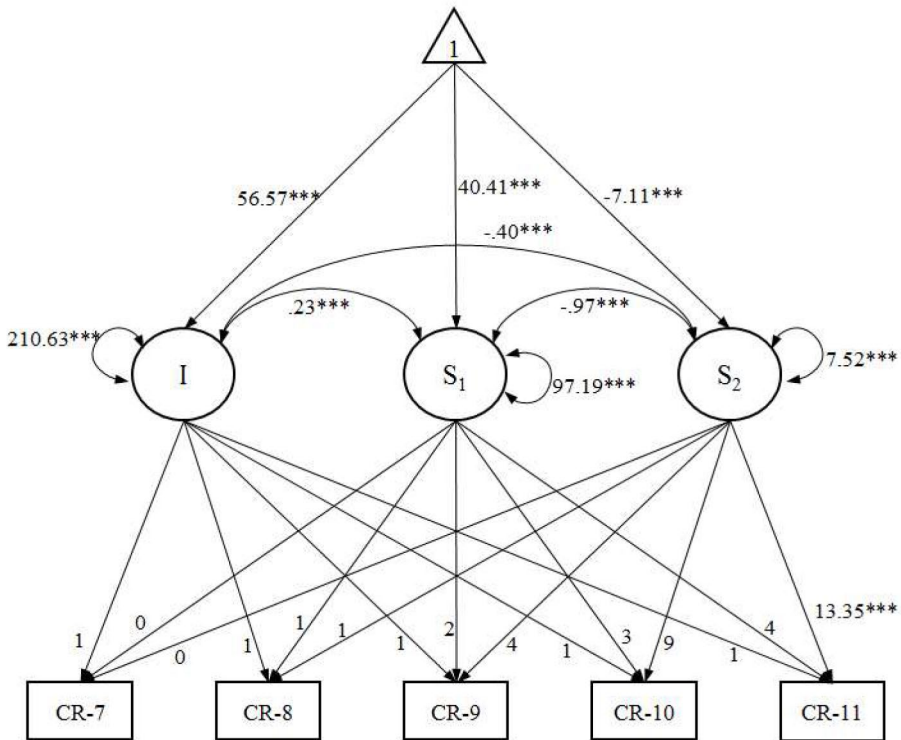


Fig. 3 Baseline latent growth curve model of Chinese word reading. I=initial status, S_1 =linear growth factor, S_2 =quadratic growth factor, CR=Chinese word reading. The numbers following the hyphens indicate the ages at which the tasks were administered. *** = $p < .001$

their word reading development. Another possible explanation is that Chinese parents usually drill their children, asking them to write characters and words many times in order to memorize them (Lin et al., 2009). This large amount of practice may help to reduce the difference among children from different SES backgrounds in their Chinese word reading. Furthermore, having Chinese as the main oral and written language both at home and at school, as is the case in Beijing, provides children from low SES families sufficient opportunities to learn Chinese. Therefore, the association of SES and Chinese reading was mainly mediated by other skills in the present study.

Phonological awareness and vocabulary knowledge were shown to fully mediate the association between SES and the initial status and developmental trends in Chinese word reading. These mediation effects on the association between SES and the initial status/the linear development of Chinese word reading development match with previous findings in children's L1 literacy development in alphabetic languages, that children from high SES families tend to develop better linguistic skills (Burgess, 2002; Farkas & Beron, 2004), resulting in better word reading. Lei et al. (2011) suggested that the mothers of Chinese children who are initially lagging behind in phonological skills tend to have relatively low educational attainment levels. Chung et al. (2017) also found differences in phonological awareness between middle-SES and

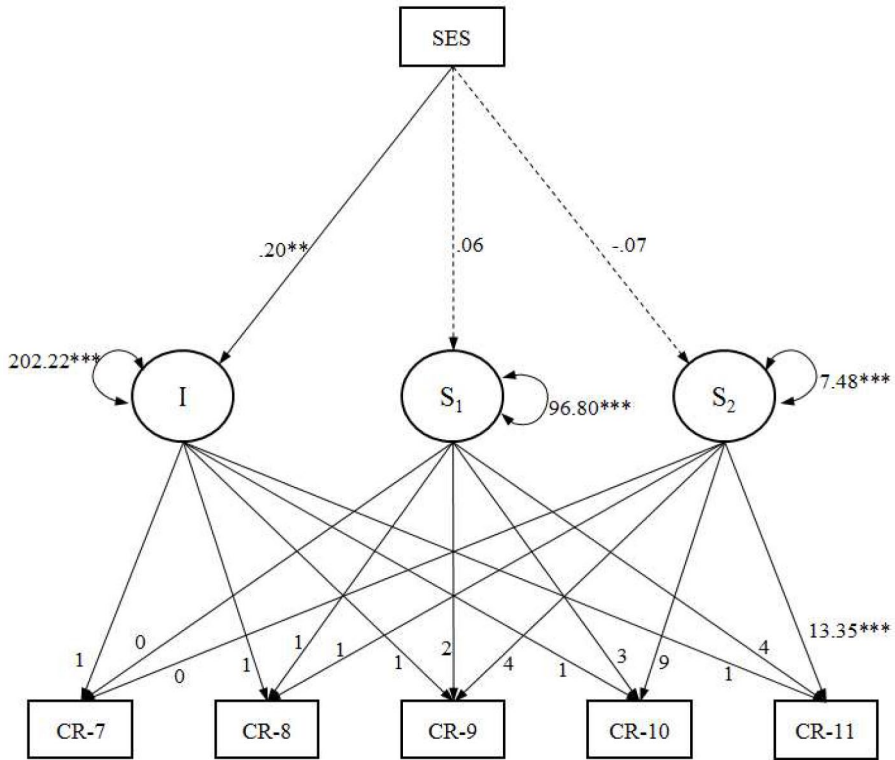


Fig. 4 The relations between SES and the initial status, linear and quadratic growth factors of Chinese word reading. I=initial status, S₁=linear growth factor, S₂=quadratic growth factor, CR=Chinese word reading. The numbers following the hyphens indicate the ages at which the tasks were administered. Dotted arrows denote insignificant effects. Error variances and covariances are not shown for clarity. ** = $p < .01$, *** = $p < .001$

low-SES Chinese children. These findings suggest that SES does have an influence in shaping children’s phonological sensitivity even in a nonalphabetic language and script. Noble et al. (2006) proposed that advantaged parents are more likely to notice children with weak phonological awareness and to have the resources to increase the children’s exposure to phonological activities or to use alternative educational strategies, leading to better phonological awareness of their children as compared with those from low SES families. In addition, SES also affects vocabulary acquisition. Oral vocabulary provides the basis for children to learn print-sound correspondences. Previous research has shown that children from higher SES backgrounds are more likely to have encountered larger numbers of words through the high quality of parent-child interactions, such as shared book reading, which has been shown to help in learning new vocabulary (Hood et al., 2008); These activities are shown to have a positive influence on reading development (Wood, 2002). These factors may also be valid in the Chinese context. Phonological awareness has been shown to influence the development of vocabulary, morphological awareness, and reading accuracy among Chinese children (Pan et al., 2011, 2016; Song et al., 2015). Vocabulary knowledge

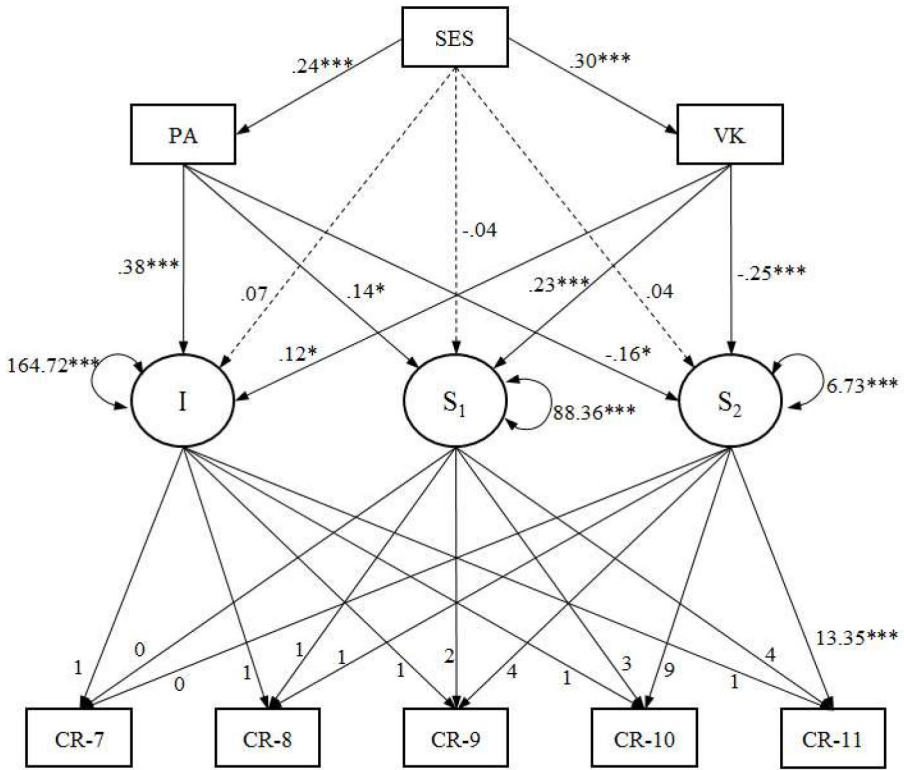


Fig. 5 Mediation effects of early linguistic skills on the relation between SES and the initial status, the linear and quadratic growth factors of Chinese word reading. I=initial status, S_1 =linear growth factor, S_2 =quadratic growth factor, PA=phonological awareness, VK=vocabulary knowledge, CR=Chinese word reading. The numbers following the hyphens indicate the ages at which the tasks were administered. Dotted arrows denote insignificant effects. Error variances and covariances are not shown for clarity. * = $p < .05$, *** = $p < .001$

also lays the foundation for learning printed words in primary education. Children’s vocabulary development has been found to be associated with their mothers’ education levels (Song et al., 2015). Parents from higher SES families may be more likely to conduct more home-based literacy-related parent-child activities, and provide more resources in supporting their children’s learning processes, which in turn, boost their phonological awareness and vocabulary knowledge. Our findings that vocabulary knowledge acted as a mediator between SES and Chinese word reading in primary school differed from the finding reported by Liu et al. (2016) that kindergarteners’ vocabulary knowledge did not mediate the relationship between SES and Chinese word reading. This could be because, as children grow older, reading focuses more on processing meaning. Thus, children’s vocabulary knowledge becomes more important in the later stages of their development (Pan et al., 2016). Another reason might be that an expressive vocabulary test was used in our study, while a receptive vocabulary test was used in Liu et al. (2016).

Our findings show a slower quadratic trend in Chinese word reading development in the children from higher SES families. This might be explained by the higher starting points and faster linear development trends of those from higher SES families leading them to have mastered most of the words earlier; this could result in the slower quadratic trend observed in this study.

In comparison to the indirect effects of SES on L1 Chinese word reading, the present study documented a stronger and direct association between SES and L2 English word reading. Previous studies on the influence of SES on bilingual children's reading development have focused on children learning two alphabetic languages, with L2 as the official one in their society. The current study, together with a few studies conducted in Hong Kong (Li et al., 2012; Liu et al., 2016; McBride-Chang et al., 2012; Zhang et al., 2014) has added to our knowledge about the influence of SES on bilinguals learning two very different languages (i.e., one logographic and one alphabetic) with L1 being the main language at home and in society. The current study also expands our knowledge in terms of the long-term influence of SES on L2 English in Chinese societies.

Although we showed a direct effect of SES on English word reading in mainland China, which is in line with findings from Hong Kong (Liu et al., 2016; McBride-Chang et al., 2012), we speculate that the mechanisms behind this relation might be different in the two places. Other studies have found that children from high SES families received more scaffolding at home through daily communications in English with their parents (Chow et al., 2010) and foreign domestic helpers (FDH, Dulay et al., 2017) in Hong Kong. Given the small amount of people in mainland China with enough English knowledge to converse fluently in English (3.53% according to Wei & Su, 2012), children may not be able to receive much direct scaffolding at home. However, this does not necessarily mean that mainland Chinese parents do not consider English to be important. Rather, they may rely on external resources, such as English-speaking tutors and tutorial centers, to improve their children's English. This is supported by previous research which showed that more than 73.8% of primary students participated in some private tuition activities in mainland China (for a review, see Kwok, 2010). Zhang and Xie (2016) found that children from higher SES families were more likely to attend private tutoring and their parents were more likely to spend higher levels of tuition fees. These children tended to have higher academic achievement. These external tuition resources are also popular in Hong Kong, but there it is often in addition to daily parent-child communication in English and the presence of English-speaking FDHs in homes. Nevertheless, such tuition is less prevalent among primary students (36%, see Kowk, 2010 for a summary). Future studies are needed to investigate whether this explanation is valid.

Besides the direct effect of SES on English reading, we also demonstrated indirect effects through English letter name knowledge and phonological awareness. Children from higher SES families might have more exposure to English, thus it is not surprising to see the mediation effect of English letter name knowledge. However, our phonological awareness task was measured in Chinese. This appears to suggest some transfer from Chinese phonological awareness to English word reading. This is consistent with findings of Tong and McBride-Chang (2010), that phonological awareness (measured by syllable deletion) in Chinese (L1) significantly predicted

English (L2) reading in Hong Kong Chinese children. In general, our findings support the idea that phonological transfer might be possible even between languages with very different phonological structures (Chow et al., 2005; Gottardo et al., 2001; Saiegh-Haddad & Geva, 2008).

Vocabulary knowledge mediated the association between SES and Chinese, but it did not contribute to English word reading. In addition, it was mainly phonological sensitivity that mediated SES and English word reading. Taken together, these strongly indicate that the nature of a language is reflected by the skills needed for its acquisition and development. Chinese is a logographic script which emphasizes meaning, while English has a phonological nature. In line with this point of view, McBride-Chang et al. (2005) found, in a cross-language comparison, that morphological awareness and vocabulary were important for Chinese children's literacy development, that both morphological awareness and phonological awareness were important for learning Korean, but only phonological awareness contributed to English reading. Previous studies have also shown that adult Chinese readers can access semantics, bypassing phonology (Zhou & Marslen-Wilson, 2000; Yan et al., 2009), while the recognition of alphabetic words follows the sequential activation from orthography to phonology to semantics (Van Orden, 1987).

From a theoretical perspective, our findings extend work by Liu et al. (2016) with kindergarten to upper primary school children, suggesting a long-lasting influence of SES on literacy development, especially in L2. Our findings are also in agreement with the Family Stress Model (Iruka et al., 2012; Masarik & Conger, 2017) that SES affects academic achievement. Future studies might further explore whether this phenomenon of resources being associated with L2 reading is universal. Such different patterns in the association of SES with L1 and L2 reading also have practical implications. To help students from poor families to learn English, additional support from school would be beneficial, as they do not have as much as resources to go to tuition centers or hire private tutors like their richer peers do. Special teaching strategies need to be designed and extra English books and other resources could be provided for these children, to increase their exposure to English.

The present study has the following limitations. First, early English phonological awareness and vocabulary knowledge were not measured. Second, we did not measure SES again at a later stage. As the SES was reported by parents when the children were one year old, it is not clear how later changes in family SES could affect their literacy development. Another limitation is that the current study was part of a longitudinal study commenced around 2000, when the participating children were born, which may have affected the interpretation of the findings and the impact of the study. However, given previous findings that the influence of SES on academic attainment lasts from childhood to adolescence across different countries (for a review, see Chen et al., 2018), we consider the current findings to be useful in understanding the impact of SES on literacy development. The findings of the current study might be generalizable to other societies in which children are required to learn a L2 which is less commonly used, but it is nevertheless a very important language for their academic attainment.

To summarize, we tested the associations between SES and word reading in Chinese (L1) and English (L2) in children from ages 7 to 11 years. Our results suggest

that SES is important for reading in both scripts. Our results also suggest that more support in linguistic skills is important for children from low SES backgrounds to learn Chinese. In addition, it is important for teachers and educational policy makers to consider proper assistance to help children from low SES families to keep up with their more wealthy peers, given the importance of English globally in certain education sectors.

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Declarations

Conflicts of interest The authors have no conflicts of interest to declare.

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