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## Learning and Instruction

journal homepage: [www.elsevier.com/locate/learninstruc](http://www.elsevier.com/locate/learninstruc)

# The influence of early linguistic skills and family factors on literacy acquisition in Chinese children: Follow-up from age 3 to age 11



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## ARTICLE INFO

### Article history:

Received 22 January 2016

Received in revised form

4 December 2016

Accepted 8 December 2016

### Keywords:

Literacy acquisition

Linguistic skills

Family factors

Mediation effects

## ABSTRACT

The present longitudinal study investigated the predictive power of preschool linguistic skills and early family factors on children's comprehensive literacy skills at the end of primary school in 262 Chinese children. The results indicated that a substantial (20–34%) share of variance of 5th grade (age 11) literacy skills in Chinese could be explained by early family factors (age 3) and linguistic skills (age 3–age 5). Family socioeconomic status and parent-child reading tuition were associated with different literacy measures. A differential pattern of prediction was also observed among different literacy skills. Furthermore, path analyses indicated that the relationships between early family factors and literacy skills at age 11 were mediated by specific linguistic and cognitive skills at preschool.

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## 1. Introduction

The early prediction of school-age literacy achievement is a long-standing issue. Research has demonstrated that a series of cognitive skills developed by pre-readers, as well environmental factors supporting the development of these skills laid the foundation for later literacy ability (Whitehurst & Lonigan, 1998). However, most longitudinal studies have focused on children's literacy development up to second grade (Hulme, Bowyer-Crane, Carroll, Duff, & Snowling, 2012; Kendeou, Van den Broek, White, & Lynch, 2009) and they have focused particularly on within-child cognitive factors, or on genetic vs. environmental contributions

(Heath et al., 2014). Relatively few studies have explored the joint predictive effects of both early linguistic skills and family factors in the long-term from pre-reading to proficient reading at the end of primary school (Sénéchal, 2006). In the current study, a cohort of children tested at preschool at age 3 was followed for eight years. The main aim was to explore the long-term predictive power of both linguistic skills and early family environment on comprehensive literacy skills in proficient readers. A secondary aim was to test causal pathways between early linguistic skills, early family factors and subsequent literacy skills.

### 1.1. Early linguistic predictors of literacy skills

During the past decades, numerous studies have contributed to a better understanding of the early linguistic predictors of literacy acquisition (Georgiou, Torppa, Manolitsis, Lyytinen, & Parrila, 2012; Hulme et al., 2012; Kendeou et al., 2009; Lonigan, Burgess, & Anthony, 2000; Muter, Hulme, Snowling, & Stevenson, 2004;

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Roth, Speece, & Cooper, 2002; Wagner, Torgesen, & Rashotte, 1994). In general, differential prediction patterns for different literacy skills were observed. As for word reading ability, numerous longitudinal studies consistently demonstrated that phonological awareness, rapid automatized naming (RAN) and letter knowledge at preschool were precursors of subsequent word reading ability in preschool (Hulme et al., 2012; Lonigan et al., 2000; Muter et al., 2004) and in early primary school (Roth et al., 2002; Wagner et al., 1994). Studies on reading comprehension revealed that the key predictors were word decoding, vocabulary and listening comprehension (Kendeou et al., 2009; Roth et al., 2002). Phonological awareness, letter knowledge and RAN have been demonstrated to be important predictors of school-age spelling skill (Georgiou et al., 2012; Landerl & Wimmer, 2008; Savage, Pillay, & Melidona, 2008). Previous longitudinal studies have attempted to capture how early linguistic skills predict various literacy skills, but the majority of them have investigated such development over a relatively short period of time up to 2nd grade (Hulme et al., 2012; Kendeou et al., 2009; Lonigan et al., 2000; Muter et al., 2004; Roth et al., 2002; Wagner et al., 1994). However, children's reading and spelling abilities continue to develop over the entire period of school-age years, at least in languages with opaque orthographic systems, whether alphabetic (such as English or French) or not (e.g., Chinese). Relatively few studies have explored the long-term prediction of literacy development (Adlof, Catts, & Lee, 2010; Kirby, Parrila, & Pfeiffer, 2003; MacDonald & Cornwall, 1995). These studies either used correlation analysis (MacDonald & Cornwall, 1995) or focused on the prediction of reading disability (Adlof et al., 2010). The sample size of those studies was relatively small (from 24 to 79) (Kirby et al., 2003; MacDonald & Cornwall, 1995). Therefore, a larger-scale evaluation of the extent to which the predictive patterns of linguistic skills tested in preschool persist after several years of formal school instructions remains necessary.

### 1.2. Predictors of literacy skills in Chinese

A number of studies have consistently revealed the close relationship between phonological awareness (PA) and word reading ability across various alphabetic orthographies (Moll et al., 2014; Ziegler et al., 2010). However, the relationship between phonological awareness and reading in Chinese remains less clear. Several studies have reported a close link between phonological awareness (focusing on syllable awareness) and Chinese character recognition (e.g. McBride-Chang & Kail, 2002; Shu, Peng, & McBride-Chang, 2008). However, other studies showed no effect of phonological awareness (using a combination of phoneme and syllable awareness) on Chinese character reading (e.g. McBride-Chang et al., 2005; McBride-Chang, Shu, Zhou, Wat, & Wagner, 2003). These differences may be due to the different types of phonological awareness tasks (morpho-syllabic Chinese characters are more directly related to syllabic than to phonemic tasks), as well as to whether additional predictors of reading (e.g., morphological awareness) are included in the statistical models. Finally, a recent meta-analysis of 35 Chinese studies reflecting this diversity reported a moderate correlation ( $r = 0.36$ ) between phonological awareness and word reading accuracy (Song, Georgiou, Su, & Shu, 2015). Thus it seems relevant to study longer-term effects of PA on reading development at a relatively mature stage. Besides, it is also necessary to examine the cognitive precursors of Chinese literacy development beyond the range of phonological awareness, given the features of Chinese orthography. Morphemic units are the most prominent characteristic of Chinese (Shu, McBride-Chang, Wu, & Liu, 2006). A wide range of Chinese studies have demonstrated that morphological awareness was associated with reading performance and dyslexia (Liu, McBride-Chang, Wong, Shu, &

Wong, 2013; McBride-Chang et al., 2003; Shu et al., 2006). Moreover, Chinese writing is reputed for its visual complexity (Chen & Kao, 2002). Visual skills have been found to be essential for literacy development in Chinese children (McBride-Chang, Chow, Zhong, Burgess, & Hayward, 2005). Until now, several Chinese longitudinal studies have reported predictive effects of morphological awareness, visual skills and other linguistic skills on Chinese reading ability (McBride-Chang, Chow, et al., 2005; McBride-Chang & Ho, 2005; Tong et al., 2011). However, most of these studies focused on the short-term predictive effects in kindergartners, and on character recognition as the main indicator of reading skill. Relatively fewer studies have focused on predictors of spelling and reading comprehension (Zhang, McBride-Chang et al., 2012). Thus the present study aims to test the extent to which visual skills and morphological awareness, together with other linguistic and cognitive abilities tested before entering primary school, might predict children's literacy outcome, including Chinese character recognition, reading fluency, character spelling and reading comprehension, at a later stage of their development.

### 1.3. The role of the early family environment

Besides within-child linguistic skills, the early family environment plays a crucially important role in children's literacy development. Consequently, an extensive body of research has highlighted the importance of "socioeconomic status (SES)" in children's emergent literacy skills (Hoff, 2003; Noble, Farah, & McCandliss, 2006; Noble, McCandliss, & Farah, 2007; Rowe & Goldin-Meadow, 2009). Results from these studies consistently showed that children from high socioeconomic families had higher pre-reading and language skills prior to and upon entering formal schooling than those from low socioeconomic families. Other studies have explored the influence of more specific family factors, such as the early home literacy environment, on subsequent literacy acquisition (Deng, Silinskas, Wei, & Georgiou, 2015; Levy, Gong, Hessels, Evans, & Jared, 2006; Manolitsis, Georgiou, & Parrila, 2011; Shu, Li, Anderson, Ku, & Xuan, 2002, pp. 207–223; Sénéchal, 2006). One of the models that explain the role of home literacy environment in reading development is the home literacy model (Manolitsis et al., 2011; Sénéchal, 2006). According to the model, parent reading tuition promotes the development of early literacy skills, whereas storybook exposure promotes the acquisition of language skills. Compared with the abundant evidence on the importance of home literacy environment in alphabetic languages, studies exploring home literacy environment in Chinese children are relatively scarce (Deng et al., 2015; Li & Rao, 2000; Shu et al., 2002, pp. 207–223). For example, Deng et al. (2015) followed 177 Chinese children from Grade 1 to Grade 2 and they found no influence of home literacy environment in Grade 1 on reading in Grade 2. In another Chinese study, Shu et al. (2002, pp. 207–223) collected data on 276 first graders and 269 fourth graders and measured the home-literacy environment cross-sectionally along four dimensions (literacy resources at home, parent-child literacy-related activities, children's literacy-related activities and parents' education). They found that the four family factors could explain 10.3% and 17.5% of the variance in reading scores for the 1st and 4th graders, respectively (Shu et al., 2002, pp. 207–223). Here, we measured home literacy factors in the same way as in Shu et al.'s study, with the aim of examining whether they extend their effects on literacy skills to the end of primary school.

Furthermore, it is not easy to disentangle early family factors from early linguistic skills given that they tend to correlate with each other (Noble et al., 2007). In order to solve this problem and unravel the relationship between early linguistic skills, family factors and literacy skills, some studies have tested the impact of a

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