



# Unique predictors of early reading and writing: A one-year longitudinal study of Chinese kindergarteners

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## ABSTRACT

Children's early literacy development is a key contributor to later literacy skills and overall academic achievement. Because of the unique features of Chinese characters, it may be that predictors of literacy acquisition differ developmentally for reading and writing. In this study, we examined longitudinal predictors of reading and writing for 73 Chinese kindergarteners when they were 5; 2 (year; month) (range = 4; 9–6; 2). Word reading and writing were not significantly correlated at time 1 (T1), but were significantly associated with one another one year later (T2). At T1, the unique correlates of word reading were semantic radical awareness, rapid automatized naming, and vocabulary, whereas the only unique correlate of word writing was visual-orthographic copying skill. Semantic radical awareness at T1 uniquely predicted both word reading and word writing at T2, with age, nonverbal reasoning, and T1 performance statistically controlled. These results suggest that reading and writing differ in unique correlates in the beginning but change rapidly with development. Findings also shed light on the importance of semantic radical awareness in early literacy development in Chinese.

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Early reading and writing skills among preschoolers and kindergarteners are important and strong precursors of children's later literacy skills and school achievement (National Institute of Child Health and Human Development, 2000; Whitehurst & Lonigan, 2001). Identifying the predictors of children's early literacy skills can help early childhood educators to understand what knowledge and skills should be emphasized in promoting reading and writing at different learning stages. For example, if a given cognitive linguistic skill that can be tested early in development is a strong predictor of subsequent word reading or word writing, it can be used for early identification of those at-risk for literacy difficulties. In addition, sometimes helping a child to practice such a skill helps to facilitate subsequent literacy abilities in young children. A familiar example is the fact that teaching the "ABC" song and corresponding letter names (and sounds) helps those learning to read the Roman alphabet to read relatively efficiently.

Children's early literacy development is influenced by a number of cognitive developmental skills, including phonological awareness, morphological awareness and speed of processing (Chow, McBride-Chang, & Burgess, 2005; Lei et al., 2011; McBride-Chang,

Liu, Wong, Wong, & Shu, 2011; Shu, Peng, & McBride-Chang, 2008; Tong, McBride-Chang, Shu, & Wong, 2009). These skills are important across readers of various languages (Casalis & Louis-Alexander, 2000; Cho, McBride-Chang, & Park, 2008; Deacon & Kirby, 2004; Nikolopoulos, Goulandris, Hulme, & Snowling, 2006; Patel, Snowling, & de Jong, 2004).

Given that about one fifth of the population of the planet speaks Chinese as a native language as well as the increasing importance of Chinese as a global language for education and business, understanding Chinese literacy acquisition has become increasingly important. Reading and writing Chinese characters may require some unique skills different from those used in alphabetic languages (Chung & McBride-Chang, 2011; Tan, Spinks, Eden, Perfetti, & Siok, 2005). For example, identification of letter names is less crucial than is understanding of the components, particularly radicals, of Chinese characters. Also, to date, much more is known about word reading than word writing in Chinese. To fill in this gap, the present study sought to investigate which particular skills, both universal and unique, would best explain young Mainland Chinese children's performance in both reading and writing, concurrently and longitudinally.

The Chinese writing system is unique in its representation of sound and meaning. Each Chinese character represents both a syllable and a morpheme rather than a phoneme (DeFrancis, 1989; McBride-Chang & Kail, 2002). In addition, Chinese appears to be

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particularly visually complex. A character consists of a configuration of strokes. The majority of the 2570 characters taught in primary school in Mainland China have 7–12 strokes; some have more than 20 strokes (Shu, Chen, Anderson, Wu, & Xuan, 2003). About 82% of modern Chinese characters are compound characters that consist of a semantic radical and a phonetic radical. Radicals are stroke patterns that recur across characters. The semantic radical gives some clue to the character's meaning, and the phonetic radical gives some clue to the character's pronunciation. Left-right and top-down structures are the two major types of structure of characters. In a left-right structure character the semantic radical usually appears on the left and the phonetic radical falls on the right, whereas in a top-bottom structure character, the semantic radical usually appears at the top and the phonetic radical usually appears at the bottom.

For Chinese word reading, previous studies have highlighted several correlates including morphological awareness (Li, Shu, McBride-Chang, Liu, & Peng, 2012; McBride-Chang, Shu, Zhou, Wat, & Wagner, 2003; Pan et al., 2011; Tong et al., 2009), rapid automatized naming (RAN), phonological awareness (Li, Peng, & Shu, 2006; McBride-Chang & Ho, 2005; McBride-Chang, Bialystok, Chong, & Li, 2004; Shu et al., 2008; Siok & Fletcher, 2001), and vocabulary knowledge (Pan et al., 2011; Shu, McBride-Chang, Wu, & Liu, 2006). More than 70% of Chinese words are compounds that consist of two or more morphemes (Institute of Language Teaching and Research [of China], 1986). Even at the early stage of Chinese learning, children may recognize these patterns in compound words. Thus, as an aspect of Chinese morphological awareness, lexical compound awareness can be important for children's beginning learning. RAN is usually assessed by very simple tasks where children name aloud symbols (letters or numbers), objects or colors as quickly as they can. RAN has been hypothesized to reflect at least partly the arbitrary mappings between orthography and phonology (Manis, Seidenberg, & Doi, 1999). Given that Chinese is a deep orthography in which sound – symbol correspondences are relatively opaque, as described earlier, RAN skills should presumably be important for reading in Chinese early on. Chinese reading is a process of mapping syllables to characters. Thus, syllable awareness as a level of phonological awareness should be particularly important in Chinese reading. Vocabulary knowledge, as a measure of general language skills, has been found to be a unique developmental predictor for all Chinese literacy skills as well (Pan et al., 2011).

In addition to the above-mentioned established cognitive and linguistic skills that are found to relate to Chinese word reading, a novel task was included in the present study to examine the correlates of early Chinese literacy, namely, semantic radical awareness (Lam & McBride-Chang, 2013). Semantic radical awareness refers to the sensitivity to morphemic structure of Chinese characters (Li, Anderson, Nagy, & Zhang, 2002; Shu & Anderson, 1997). For example, “木” is the semantic radical (meaning “wood”) in the compound character “松” (meaning “pine”). An early attempt to specify the role of semantic radical awareness in Chinese children's literacy acquisition was made by Shu and Anderson (1997). They found that primary school children were aware of the relationship between semantic radical and character meaning. Additionally, semantic radical knowledge was found to be necessary for reading skill. Shu (2003) reported that primary-school-aged children could recognize the subcomponents of a given character before memorizing the whole character. Semantic radical knowledge depends on one's learning experience. The present study further examined the role of semantic radical awareness in younger children's concurrent and subsequent Chinese literacy development.

For Chinese word writing, correlates are less clear compared with Chinese word reading. In models of word reading and word writing in alphabetic orthographies, some (Bradley & Bryant, 1979; Goswami & Bryant, 1990) have proposed that there is a

discrepancy and a separation between children's reading and spelling in early development. Reading is often a poor predictor of spelling in young children, though spelling tends to explain reading (Bosman & Van Orden, 1997; Caravolas, Hulme, & Snowling, 2001). However, there are strong correlations between reading and spelling over time in alphabetic orthographies (Ehri, 1997). To what extent are early reading and writing processes in Chinese separable or overlapping? And how do early cognitive and linguistic skills contribute to reading and writing in the early childhood years? The most recent findings from the Early Childhood Longitudinal Study-Kindergarten (ECLS-K) and the National Assessment of Education Progress (NAEP) highlight the need for understanding writing development and developing writing interventions for both young children and disabled learners (Miller & McCardle, 2011).

Chinese writing is, to the beginner, a process of converting oral language to seemingly arbitrary visual forms without clear phonological cues. Learners should write each stroke according to the configurations of the characters. Such writing is complicated because stroke order is inflexible but nonintuitive to beginning learners; thus, much of writing mastery involves internalizing the visual-motor aspects of this writing (Kao, 2006).

Tan et al. (2005) asserted that copying of Chinese characters might facilitate children's internalization of the visual-orthographic aspects of Chinese writing. Additionally, visual-motor integration can improve the formation of long-term motor memory of Chinese characters. By repeatedly copying, children may gradually attend to stroke order, which is essential for expert word representation in Chinese (Flores d'Arcais, 1994; Yeung, Ho, Chan, & Chung, 2013). Thus, copying practice might help children develop better spontaneous writing of correct forms of Chinese characters. Indeed, parents and educators typically emphasize rote learning of Chinese characters as the best way for children to learn to read and write in the initial learning stage (Li & Rao, 2005; Packard et al., 2006; Wu, Li, & Anderson, 1999).

Ziegler and Goswami (2005) talked about an inverse progression of orthographic and phonological development in their psycholinguistic grain size theory. Chinese writing and reading stage models also capture this progression from small-to-large and large-to-small unit sizes. Children learn whole characters when they begin to read in Chinese; gradually they come to understand the function of smaller radicals within characters to help them read new characters (Ho, Yau, & Au, 2003; Shu, 2003). Chinese children's writing units evolve from strokes to larger units of strokes (radicals) and logographemes (the whole characters) (Shi, Li, Zhang, & Shu, 2011). Thus, copying skill, which can facilitate children's memory for strokes and implicit knowledge of character structure, might be particularly important for acquiring writing in an early learning stage. Wang, McBride-Chang, and Chan (2013) found that copying skill was associated with word writing in Chinese kindergarteners. In the present study, we moved further to look at the association of word reading with writing, as well as the specific correlates of each, in Mainland Chinese kindergarteners. We included semantic radical awareness, which was not included in previous investigations, and copying skills.

We considered two types of copying skills that might be important for children's early writing skill. One is “pure” copying of unfamiliar two-dimensional print of which children have no prior cognitive or orthographic experience or knowledge. This pure copying skill captures relatively pure integrated visual-motor skills relevant to Chinese writing and distinguished dyslexic and nondyslexic Hong Kong Chinese children in one study (McBride-Chang, Chung, & Tong, 2011). The other, visual-orthographic copying skill, combines visual-motor skill with visual-orthographic knowledge. Visual-orthographic knowledge in Chinese typically implies knowledge of the positions, structuring, and functions of the radicals within Chinese characters (McBride-Chang, Chung,

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