The Stability of Literacy-Related Cognitive Contributions to Chinese Character Naming and Reading Fluency

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Abstract The present study examined the developmental issue of cognitive factors that explain Chinese literacy. Phonological awareness, rapid automatized naming, short-term memory, orthographic awareness and morphological awareness and two literacy tasks (character naming and reading fluency) were administered to 408 second-graders, 428 fourth-graders and 496 six-graders. Results from linear regression analysis and path analysis model showed that the five reading-related cognitive constructs explained unique variances in character naming. Second, character naming is primary for reading fluency after controlling other cognitive constructs; third, the relation between the cognitive factors and literacy changes significantly as a function of reading skills. Results give a clear direction to understanding Chinese reading development.

Keywords Chinese · Character naming · Reading fluency · Cognitive skills

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Introduction

Traditional accounts of reading development have stressed the importance of different cognitive factors for literacy. An extensive body of research in both alphabetic languages (Goswami et al. 2005; Hulme et al. 2007; Singson et al. 2000; Snowling et al. 1997; Wimmer 1993) and non-alphabetic languages such as Chinese (Ho and Lai 1999a; Ho and Ma 1999b; McBride-Chang et al. 2004; Shu et al. 2008) have confirmed the contributions of a variety of literacy-related cognitive skills to literacy. However, a consensus on the more specific organization of cognitive factors necessary for literacy learning across different stages of development has still not been reached (e.g., Liao et al. 2008). One purpose of the present study was to examine the developmental issue of cognitive factors that explain Chinese literacy. We tested five key constructs of cognitive skills tapped in previous studies in both alphabetic and Chinese scripts, including verbal memory (Ho and Lai 1999a), phonological awareness (Ho and Ma 1999b), orthographic awareness (Packard et al. 2006) morphological awareness (McBride-Chang et al. 2003; Shu et al. 2008), and rapid automatized naming (RAN) (Ho and Lai 1999a; Liao et al. 2008). The five constructs have also been addressed to have the differential value in understanding literacy (e.g., Bailey et al. 2004; Lyytinen et al. 2004). The importance of these constructs for reading of Chinese has been reviewed elsewhere (Ho et al. 2004; Li et al. 2010).

Due to the developmental nature of literacy learning, a large body of research on alphabetic languages indicates that different sets of cognitive skills participate in literacy development in different ways at different stages. For instance, Sawyer (1992) found that in preschool, reading ability was influenced more by short term memory and word retrieval speed. In contrast, fine phonological and orthographic representations would impact more on word recognition in the higher grades. In a cross-sectional study, Torgesen et al. (1997) found that phonemic awareness and RAN predicted reading ability more successfully in the second and third grades. They further indicated that RAN is more predictive of accuracy, speed in word analysis, and reading speed in the fifth grade. It seems that the cognitive skills that would make effective predictions on reading change with increasing age.

Besides, reading development has a language-related origin. The predictors and manifestations of successful reading may vary for speakers of different languages. Chinese script differs from alphabetic languages in the morphological expressions and the phoneme-grapheme mapping system. The basic symbols of written Chinese are characters. Children are expected to learn more than 2,500 characters by the time they leave the sixth grade and thousands more are learned by high school and college (Shu and Anderson 1999). In contrast to the alphabetic scripts, Chinese does not have the grapheme-phoneme correspondence rules of alphabetic languages. Chinese characters are developed in six principles including pictographic, ideographic, logical aggregates, semantic-phonetic compound, transference, and loan. There are 5,631 semantic-phonetic compounds, accounting for 81% (Li and Kang 1993) of the total 7,000 frequent characters (National language commission of China 1989). According to the analysis of the “School Chinese Corpus” (which contains 2,570 characters used in the elementary school textbooks in Beijing), about 74% of the Chinese characters taught in elementary schools are semantic-phonetic compounds (Shu et al. 2003). In the current study, semantic-phonetic compound characters account for 71%. These compound characters typically comprise two distinct parts, a phonetic radical and a semantic radical. The phonetic radical gives some indication of the sound of the character, while the semantic radical suggests the meaning. Phonetic radicals for regular Chinese characters play an important role in extracting the rules for decoding, but the predictability of reading regular Chinese characters is quite different from that in reading English. In reading Chinese regular