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Development of reading-related skills in Chinese and English among Hong Kong Chinese children with and without dyslexia

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ABSTRACT

This 2-year longitudinal study sought to identify a developmental pattern of Chinese and English reading skills in children with and without dyslexia from 6 to 8 years of age. Three groups of 15 children each—those with dyslexia, age-matched (AM) controls, and reading-matched (RM) controls—participated. Dyslexia was diagnosed at 8 years of age. All children were tested on phonological awareness, rapid automatized naming (RAN), morphological awareness, word reading, and vocabulary knowledge in both Chinese and English and also speed of processing skill. AM controls outperformed the group with dyslexia on all measures except for phonological awareness, English word reading, and vocabulary. However, those with dyslexia and AM controls developed at a similar rate across all reading-related skills from 6 to 8 years of age. Compared with the RM controls, the group with dyslexia scored higher in phonological awareness, morphological awareness, and vocabulary knowledge in both Chinese and English and also in English word reading but scored similarly in RAN. Children with dyslexia, thus, manifested clear difficulties in Chinese vocabulary knowledge, morphological awareness, and RAN as well as general speed of processing, representing a developmental lag in cognitive skills. Among these, RAN deficits are likely to be the most severe deficits in Chinese children with dyslexia.

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Introduction

Dyslexia is generally regarded as a specific reading difficulty in accurate and/or fluent word recognition, spelling, and decoding abilities (e.g., Lyon, Shaywitz, & Shaywitz, 2003; Tunmer & Greaney, 2010) across different languages. Research on developmental dyslexia in Chinese currently focuses on at least two questions. First, as researchers embrace a multiple deficits model of Chinese reading difficulties (e.g., Ho, Chan, Lee, Tsang, & Luan, 2004; Ho, Chan, Tsang, & Lee, 2002), what are the important cognitive correlates of dyslexia in Chinese? Second, given that the curriculum for Hong Kong Chinese children strongly emphasizes knowledge of English as a second language from 3 years of age (e.g., Cheung & Ng, 2003), to what extent is dyslexia in Chinese as one's first language associated with difficulties in reading English as a second language?

There are several cognitive difficulties that those with dyslexia manifest, supporting the idea of multiple deficits for dyslexia. The model proposed by Pennington (2006) suggested a multi-factorial etiology of complex behavioral disorders for when no single genetic or environmental factor is sufficient to cause dyslexia. Rather than being discrete and categorical, cognitive deficits found in dyslexic children are continuous and quantitative, which consequently leads to comorbidity. Researchers have been proposing various causes for developmental dyslexia, ranging from a phonological factor (Morris et al., 1998; Stanovich, 1988, 1991), to a rapid naming speed deficit (Wolf & Bowers, 1999), to an orthographic factor (Badian, 1997), to a visual deficit (Rayner & Pollatsek, 1989; Watson & Willows, 1993; Willows, Corcos, & Kershner, 1993) or even broader language skills (e.g., Nation & Snowling, 2004); each of these is somewhat supported by evidence. Therefore, in the current study, which aimed to examine the multi-deficit hypothesis in Hong Kong children, we included assessments of the abovementioned areas in their native language (i.e., Chinese).

Research on early longitudinal predictors of dyslexia (McBride-Chang, Lam, Lam, et al., 2008; McBride-Chang et al., 2011) and poor reading (Lei et al., 2011) in Chinese children has identified rapid automatized naming (RAN) and morphological awareness as particularly strong early markers in children in the age range of 4 to 7 years. Research studies on cognitive markers of primary and secondary school typically developing Chinese children in Hong Kong have also identified RAN and morphological awareness in addition to orthographic skill, an ability that is easier to measure as children's reading knowledge progresses, as among the strongest correlates of dyslexia (Chung, Ho, Chan, Tsang, & Lee, 2011; Ho et al., 2002, 2004; Shu, McBride-Chang, Wu, & Liu, 2006).

RAN can be seen as a unique construct that taps a child's integration of lower level visual perceptual and higher level cognitive processes (Wolf & Bowers, 1999). The simple task mimics the essential core of reading, making a rapid visual–verbal connection. The RAN score correlates with variations in early reading skills both concurrently and longitudinally, even after statistically controlling children's phonological awareness and verbal IQ (Compton, 2003; de Jong & van der Leij, 1999; Parrila, Kirby, & McQuarrie, 2004; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Wagner et al., 1997; Wolf & Bowers, 1999). A significant impairment in RAN tasks has been observed in dyslexic children when matched with both age-matched controls and reading-matched controls in studies of alphabetic readers (e.g., Araujo, Pacheco, Faisca, Petersson, & Reis, 2010; Fawcett & Nicolson, 1994); similar results were found for Chinese (e.g., Chung et al., 2011; Ho & Lai, 1999).

Although speeded naming deficits are often observed in children with dyslexia, some have argued that general processing speed might underpin this difficulty (Catts, Gillispie, Leonard, Kail, & Miller, 2002; Kail, Hall, & Caskey, 1999; McBride-Chang & Kail, 2002; see Savage, 2004, for a review). In some studies of both Chinese and English reading (Kail & Hall, 1994; McBride-Chang & Kail, 2002), processing time is indeed a predictor of naming speed. At the same time, however, there is more evidence that dyslexia is linked to RAN difficulties than to nonlinguistic automaticity measures (e.g., Savage, 2004). Thus, in the current study, in addition to a RAN task, we also included a measure of general processing speed—the Woodcock–Johnson Tests of Cognitive Ability (visual matching)—in early testing times to test the extent to which both RAN and general speed of processing might independently distinguish those with and without dyslexia.