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A componential model of reading in Chinese

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ABSTRACT

This study examined the interrelationships between linguistic comprehension skills (expressive vocabulary, word definition, oral narrative skills, and syntactic skills), decoding (word recognition and reading fluency) and reading comprehension (sentence comprehension and passage comprehension) among 369 Cantonese-speaking Chinese children in a 3-year longitudinal study from Grade 1 to Grade 3. Multiple regression analysis and structural equation modeling results suggested that the component skills of Chinese reading comprehension can be categorized into two major components: linguistic comprehension and decoding. The former is made up of oral narrative skills and syntactic skills, while the latter is made up of word recognition and reading fluency. The additive (i.e., linear) model with linguistic comprehension and decoding as predictors of reading comprehension provided an adequate account of the data in most analyses. The product of linguistic comprehension (syntactic skills) and decoding (word recognition/reading fluency) accounted for a significant amount of variance in passage comprehension at Grade 1 in addition to the linear contribution of linguistic comprehension and decoding.

1. Introduction

1.1. Simple view of reading

The simple view of reading (SVR) (Gough & Tunmer, 1986) was one of the earliest attempts to postulate the nature of the relationship between oral language and reading. Gough and Tunmer's model of the proximal causes of reading performance captured the interplay of print skills and oral language in reading by positing that reading comprehension is equal to the product of two broad components: linguistic comprehension and decoding. Although the simplicity of the SVR model in conceptualizing the complexity of the reading process is widely acknowledged, there has been debate over the definitions of and the relationships between the two core constructs in the model. Hoover and Gough defined linguistic comprehension as "the ability to take lexical information (i.e., semantic information at the word level) and derive sentence and discourse interpretations" (Hoover & Gough, 1990, p. 131), and decoding as "efficient word recognition" (Hoover & Gough, 1990, p. 130).

Although the model has been well supported by empirical findings, there has been an increasing demand for a more refined conceptualization of the model (e.g., Kirby & Savage, 2008; Ouellette & Beers, 2010). The present study aimed to revisit the SVR in the context of a non-alphabetic language, Chinese, and in light of the following three areas of concern over the conceptualization of the different components of the SVR.

First, questions have been raised about the adequacy of listening comprehension skills, one of the most commonly used measures of linguistic comprehension, in capturing the contribution of oral language to reading comprehension. Many studies on the validity of the SVR for readers of alphabetic languages have used listening comprehension measures to assess linguistic comprehension, whether among young children (e.g., Cain, Oakhill, & Bryant, 2004; Nation & Snowling, 2004; Stothard & Hulme, 1992) or college students (e.g., Gernsbacher, Varner, & Faust, 1990; Palmer, MacLeod, Hunt, & Davidson, 1985). However, in addition to listening comprehension skills, oral vocabulary, semantic skills, and grammatical skills are likely to contribute to the construct of linguistic comprehension. This has found some support in recent studies on reading comprehension. For example, in several studies, oral vocabulary explained a significant amount of variance in reading comprehension even after the contribution of listening comprehension and decoding was controlled (e.g., Braze, Tabor, Shankweiler, & Mencl, 2007; Nation & Snowling, 2004; Ouellette & Beers, 2010). In a 2-year longitudinal study by Muter, Hulme, Snowling, and Stevenson (2004), oral vocabulary and syntactic skills were found to predict reading comprehension among beginning readers. Oral vocabulary and syntactic skills were significant predictors of English reading comprehension among children in Grades 2 to 5 (e.g., Geva & Farnia, 2012;

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Proctor, Silverman, Harring, & Montecillo, 2012). To date, the attention on the role of oral vocabulary in reading comprehension far outweighed that of syntactic skills (Shiotsu & Weir, 2007). In view of these findings, measures of listening comprehension, oral vocabulary, and syntactic skills were incorporated in the present study for a more comprehensive estimate of the construct of linguistic comprehension.

Second, although both decoding efficiency and decoding speed were recognized in the original model (Hoover & Gough, 1990), most studies of the SVR have measured decoding in terms of accuracy (Kirby & Savage, 2008). It seems that decoding that is accurate but slow may not be sufficient to facilitate reading comprehension. As highlighted in the models of reading comprehension by Perfetti and colleagues (e.g., Perfetti, 1999; Verhoeven & Perfetti, 2008), it is fluency in reading that is essential to reading comprehension. Therefore, the decoding component in the present study was made up of both decoding accuracy and fluency measures.

Third, although past studies have suggested that linguistic comprehension (LC) and decoding (D) are independent components of reading comprehension (RC) (e.g., Adlof et al., 2006; Carver, 1998; de Jong & van der Leij, 2002; Hagtvet, 2003), there has been debate about the nature of the interaction between the two components in the reading process (Joshi & Aaron, 2000). On the one hand, the original model by Hoover and Gough (1990) proposed that the relationship between linguistic comprehension and decoding is multiplicative in nature. Progress in reading comprehension requires both components (linguistic comprehension and decoding) to be non-zero. While linguistic comprehension and decoding explain a substantial amount of variance in reading comprehension, estimates of reading comprehension are significantly improved with the inclusion of the product of the two components. In other words, progress in reading comprehension over the levels of linguistic comprehension is conditional upon the levels of decoding, and that progress in reading comprehension over the levels of decoding is conditional upon the levels of linguistic comprehension. This was supported by the findings of Hoover and Gough's (1990) study among English-Spanish bilingual children, which showed that the product of linguistic comprehension and decoding accounted for an additional significant amount of variance in reading comprehension even after controlling for the contribution of the linear combination of linguistic comprehension and decoding.

On the other hand, other researchers have proposed that the relationship between these two components is additive (e.g., Chen & Vellutino, 1997; Conners, 2009; Dreyer & Katz, 1992); that is, reading comprehension can be adequately explained by the linear combination of linguistic comprehension and decoding. In their studies among monolinguals, these researchers found that the additional amount of variance in reading comprehension explained by the product of linguistic comprehension and decoding was nonsignificant beyond the amount of variance in reading comprehension explained by the linear combination of linguistic comprehension and decoding. The fact that the participants in these studies were monolinguals, and those in the study by Hoover and Gough (1990) were bilinguals was thought to have contributed to the different results. Conners (2009) suggested that the presence of more zero-level performers among bilinguals may have increased the strength of the contribution of the product term (of linguistic comprehension and decoding) in the study by Hoover and Gough (1990).

Most of the studies providing support for the SVR were conducted in English (e.g., Aaron, 1991; Adlof, Catts, & Little, 2006; Conners, 2009; Joshi & Aaron, 2000; Kendeou, Savage, & van den Broek, 2009; Muter, Hulme, Snowling, & Stevenson, 2004) and other alphabetic orthographies (e.g. Dutch, de Jong & van der Leij, 2002; French, Megherbi, Seigneuric, & Ehrlich, 2006; Greek, Kendeou, Papadopoulos, & Kotzapoulou, 2013; Norwegian, Høien-Tengesdal & Høien, 2012; Swedish, Høien-Tengesdal, 2010). Florit and Cain (2012) conducted a comprehensive meta-analysis to test the validity of the SVR for beginning readers of English and other, more transparent, orthographies. Their analysis showed that the relative influence of linguistic comprehension and decoding on reading comprehension was influenced by the transparency of the orthography to be mastered. In general, decoding was more influential than linguistic comprehension for beginning readers of English than for readers of more transparent orthographies. Moreover, while real word decoding accuracy was more influential for English, decoding fluency was a good predictor of reading comprehension for English and more transparent orthographies. Key differences in the relationships between different measures of decoding and reading comprehension were found among readers of languages that differ in orthographic depth.

The nature of the relationship between linguistic comprehension and decoding has rarely been examined in the context of Chinese reading comprehension. There have not been any published studies examining the interaction effects of linguistic comprehension and decoding in Chinese reading comprehension. The present study aimed to address this gap in the literature by investigating the predictive power of both the additive model (i.e., $RC = LC + D$) and the multiplicative model (i.e., $RC = LC + D + [LC \times D]$) with respect to Chinese reading comprehension.

1.2. Characteristics of the Chinese writing system

Given its distinct linguistic features, Chinese, an orthography that is more opaque than English, serves as a good test case for how well the SVR can conceptualize the components that predict reading comprehension across the orthographic depth spectrum. The basic graphic unit in Chinese is the character. More than 80% of Chinese characters are ideophonetic compounds (e.g., Ho & Bryant, 1997; Kang, 1993), the sounds of which can be derived either directly from their phonetic radicals or indirectly by analogy with characters having the same phonetic radical. However, the predictive accuracy of the pronunciation of an ideophonetic compound character has been shown to be less than 30% (Chung & Leung, 2008; Fan, Gao, & Ao, 1984; Shu, Chen, Anderson, Wu, & Xuan, 2003; Zhou, 1978). Moreover, the phonological information conveyed by a Chinese radical is not that of segmental phonemes but is more like the sublexical units of onsets and rimes (Leong, Cheng, & Lam, 2000). In this connection, unlike the grapheme-to-phoneme correspondence (GPC) rules in alphabetic languages, the "orthography-phonology correspondence" rules in Chinese (Ho & Bryant, 1997) do not allow the "assembly of phonology" or phonological decoding (Leong et al., 2000). Although phonological processing is involved in reading Chinese characters and words, the process underlying word recognition in Chinese differs from that of decoding in alphabetic languages. It is thought that phonological decoding plays a much smaller role in word reading in Chinese than in alphabetic writing systems. This is particularly the case for students learning Chinese in Hong Kong. Because there is no phonetic system, like Pin-yin in Mainland China, to assist Chinese character learning in the Hong Kong classroom, most Chinese children in Hong Kong learn to read Chinese with a "look and say" method and rely a lot on rote learning.

Another unique characteristic of learning to read in Chinese is the fact that the official spoken Chinese language, Mandarin (i.e., Putonghua), is only one of the 241 dialects spoken in China (Chung & Leung, 2008). While there is a high degree of similarity between Mandarin and Modern Standard Written Chinese (the major written form of Chinese), other dialects bear varying degrees of resemblance to Modern Standard Written Chinese. In Hong Kong, the majority of Chinese people speak the Cantonese dialect. The Cantonese dialect is the "most widely known and influential variety of Chinese other than Mandarin" (Matthews & Yip, 2011, p. 2) and is used by around 130 million Chinese in Southern China, Hong Kong, Australia, Britain, Canada and the United States (Tse, Chan, & Li, 2005). Cantonese differs significantly from Modern Standard Written Chinese in vocabulary, syntax and pragmatics. Although there have been relatively few studies comparing the grammars of Cantonese and Mandarin (e.g., Ouyang, 1993; Liang,