Effective teaching instructions for Hangul learning among Korean kindergartners

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Abstract

This study assessed the effects of four types of teaching instruction for Hangul learning in Korean kindergartners. Forty-five four-year-old children participated in a Hangul learning experiment where they were taught 6 new Korean Guljas (Korean written syllable) in each of four conditions–whole Gulja, alphabet letter, CV (consonant + vowel) body and coda subsyllabic units, and copying. Participants were separated across three reading levels, namely, emergent readers, novice readers who could read regular Hangul words, and good readers who could read regular and irregular words. Effective training methods were different depending on children's reading level. Holistic whole Gulja instructions were effective for Hangul Gulja learning in emergent readers, whereas copying and analytic CV-coda instructions facilitated Hangul learning in novices. However, there were no differences among the four types of instructions among good readers. Copying apparently facilitates learning to read Hangul, but the effect of letter instruction is limited to the beginning level of Hangul learning. These results highlight the effectiveness of teaching instructions depending on children's reading level and the characteristics of Hangul.

Keywords Hangul reading · Teaching instructions · Copying · CV syllable · Coda

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Introduction

When Hangul was invented by King Sejong and his scholars in the fifteenth century to facilitate the literacy of the Korean people, a scholar, Chung Inje famously said that "it can be learned in a single morning in bright people but in 10 days in not-so bright people." Partly due to this statement, many Korean people, even many kindergarten teachers, think that Korean children learn Hangul by themselves (e.g., Cho, 2003) and that there are few children with dyslexia among young Hangul learners. However, some Korean children do suffer from reading difficulties of Hangul (e.g., Cho & Ji, 2011; Park & Uno, 2012). Hangul is a shallow orthography and is called an alphasyllabary since Hangul is an alphabet but the Hangul syllable is printed in a square block like a Chinese character (Taylor & Taylor, 2014). Hangul syllable structure is relatively simple in that it mostly consists of CV and CVC structures. Partly due to the characteristics, Hangul is widely considered one of the easiest scripts to learn. Thus, few researchers have focused on effective ways to learn Korean, especially for beginning learners. The present study examined and compared the effectiveness of four different teaching instructional methods, namely, whole word, letter, CV (consonant + vowel) and coda subsyllabic units, and copying for children's Korean reading in Korean kindergarten children.

Reading models, stages and strategies

The acquisition of writing systems progresses from earlier stages (or phases) to advanced ones as children develop and learn (Ehri, 1998, 2005; Frith, 1985; Marsh, Friedman, Welch, & Desberg, 1981; Tong & McBride-Chang, 2010; Treiman & Rodriguez, 1999). Across various reading models, each stage is characterized by a particular primary strategy (e.g., Ehri, 1998; Treiman & Rodriguez, 1999). Early strategies are likely visual and holistic, whereas advanced ones are more analytic (Defior & Serrano, 2005; McBride-Chang & Treiman, 2003), although salient psycholinguistic grain sizes to be analyzed differ depending on scripts to be learned, such as alphabets, logographies, and alphasyllabaries (e.g., Ziegler & Goswami, 2005).

For example, the influential stage theory of Ehri suggests that the acquisition of an alphabetic writing system advances across four stages of pre-alphabetic, partial alphabetic, full alphabetic, and orthographic or consolidated alphabetic stages (Ehri, 1998, 2005). At the first pre-alphabetic or logographic stage, children focus on visual cues of words to connect them to the words' pronunciations or meanings. In a second partial alphabetic phase, children begin to segment a word's pronunciation into its component phonemes and learn correspondences between alphabet letters and phonemes in words. With practice and learning, children enter the full alphabetic phase where analytic decoding skills and letter-to-phoneme connections become complete. In the final orthographic stage, children take advantage of letter sequences and patterns that many different words share.

Examining English reading strategies at different reading stages, Treiman and Rodriguez (1999) tested two groups of English-speaking children, namely, pre-readers and novice readers among 5-year-old children in a paired-associate learning activity. Prereaders were emergent readers who were unable to read any simple words, but they had good letter name knowledge though not letter sound knowledge. Novice readers could read a few simple words. Results suggested that the prereaders derived some benefit from the letter name cues only, whereas novice readers took advantage of letter sound information, i.e., the analytic alphabetic principle of grapheme-phoneme correspondences. Adapting a similar paired-associate learning paradigm, McBride-Chang and Treiman (2003) found that Hong Kong Chinese children aged five utilized similar analytic strategies, focusing on letter sound knowledge in learning L2 English words, to those of native English speaking children. McBride-Chang and Treiman (2003) highlighted the fact that beginning readers are analytic learners who search for structure in a writing system, namely English, regardless of native language.

Compared to alphabetic scripts, the Chinese writing system does not map graphemes to phonemes, and the basic orthographic units consist of relatively complex stroke patterns that take up a two-dimensional square shape (McBride, 2016). For understanding how learning to read Chinese words takes place, different developmental models have been proposed across readers of different levels: Hong Kong Chinese children progress from holistic phonological and morphological skills in kindergarten to morphological-orthographic processing involving radical knowledge in upper primary school (Tong & McBride-Chang, 2010). Phonological sensitivity tends to be relatively excluded from Chinese models or character learning in Hong Kong. In line with such ideas about Chinese reading models, Wang and colleagues (2018) demonstrated that training to explicitly separate and teach semantic and phonetic radicals in Chinese characters facilitated Chinese writing in a Chinese character learning experiment compared to other training methods, such as whole word and phonological coding of Pinyin, among second and third graders of Chinese children in Hong Kong.

In contrast to alphabetic and logographic Chinese scripts, a reading model of alphasyllabary Kannada, an Indian orthography, suggests significant associations between alphasyllabic orthographic knowledge and phonological awareness at both levels of the syllable and the phoneme among 9- to 12-year-old children (Nag & Snowling, 2012). In Kannada, orthographic syllables embody phoneme markers; this writing system is referred to as the akshara system. Children learning Kannada are first taught relatively simple aksharas with no phoneme markers [e.g., V (vowel) and Ca (consonant + /a/) syllables] followed by the akshara with two or three embedded phoneme markers (e.g., CV and CCV syllables). Nag and Snowling (2012) proposed that akshara reading facilitates children in inferring the "alphasyllabic principle," i.e., the awareness that orthographic symbols map to separate units of syllables and phonemes, and both are used to read. This model is potentially appealing for understanding Korean Hangul reading as well.

Korean Hangul encompasses an alphabet and is also called an alphasyllabary (Taylor & Taylor, 2014) since alphabet letters are written in a square block of a syllable, similar in overall shape to Chinese characters. Early Hangul literacy

instructions are more or less related to those of alphabetic, logographic Chinese and alphasyllabic scripts.

As an alphabetic script, Hangul contains the alphabetic letters of 19 consonants and 21 vowels (Kim & Davis, 2006; Taylor & Taylor, 2014, see for a detailed review). Each Hangul letter makes a sound, representing transparent letter-phoneme correspondences. Regarding Korean letter names and sounds, each consonant letter has a name and represents one sound, whereas each vowel letter has the same name as the sound it represents (Cho, 2009a; Taylor & Taylor, 2014). Consonant letter names are complicated: The name of basic consonants consists of two syllables mostly in a CV–VC form where each consonant name starts and ends with its own sound. For instance, the letter ㄴ has the name 니은 /ni.ɨ n/ and represents the sound /n/. Hangul letters are written in a square block, called a Gulja, to represent each Korean syllable, which includes letters systematically from top to bottom and from left to right (Cho, McBride, & Lin, 2017; Wang, Cho, & Li, 2017; Yoon, Bolger, Kwan, & Perfetti, 2002). The Korean Gulja structure is simple, having mostly CV (e.g., 나 /na/ 'I', 코 /ko/ 'nose'), CVC (e.g., 별 /bjəl/ 'star', 곰 /gom/ 'bear'), and CVCC (닭 /dag/ 'chicken') structures. The Hangul Gulja system shows a clear syllable boundary within a Korean Hangul word, which is similar to Chinese characters. The Gulja is visually salient, and it is considered to be the basic unit of Korean written word recognition (Simpson & Kang, 2004), which supports the idea that Hangul is an alphasyllabary (Taylor & Taylor, 2014). Phonological alternations often occur in reading multi-syllable Hangul words, although they are predictable from sound context due to the phenomena of simple coda, resyllabification, and consonant assimilation (Cho, McBride-Chang, & Park, 2008; Kim & Davis, 2006). For example, 진리 /ʤin.li/ is pronounced as 질리 /ʤil.li/ due to lateralization of /n/ and 군인 /gun.in/ as 구닌 /gu.nin/ due to resyllabification.

Korean children learn to read with the CV Gulja in their names and high frequency words earlier than the CVC Gulja and alphabet letter names and sounds at about the age of 4. Only later do children learn to divide these Guljas into component letters. In a primary school, most children master reading of regular words that have consistent letter-phoneme correspondences and irregular words that have phonological alterations. In Korea, reading of simple CV Guljas could be considered as emergent reading because Korean children learn CV Guljas earlier than Hangul alphabet letter and sound knowledge. For example, Cho (2009a) reported that 4-year-old children could identify 78% of CV Guljas, 54% of consonant letter names, 39% of vowel names/sounds, and 29% of consonant letter sounds. In addition, CV Gulja reading at Time 1 contributed longitudinally to Time 2 Hangul word reading 6 months later even with Time 1 letter knowledge and reading statistically controlled among 4- and 5-year-old children (Cho, 2009a). Interestingly, Korean children and adults tend to divide syllables into CV body and coda (a final consonant of a syllable) rather than onset-rime subsyllabic units (Kim, 2007; Yi, 1998; Yoon et al., 2002). Related to this phenomenon, Korean children have good knowledge of coda awareness, which has been found to be significantly linked to early reading and writing (Cho et al., 2008).

Different instructional methods have been used in Korea for early Hangul acquisition. The Korean kindergarten curriculum for literacy education adopted

whole-word methods and informal play-oriented methods to encourage children's motivation to read and write (see Cho, 2017a, for a review). The curriculum suggested that adults help children find familiar Guljas in their daily lives but do not explicitly teach Hangul to children. However, about 85% of children have started to learn Hangul at home, e.g., by studying commercial worksheets as part of home education or through enrolment in private institutions called 'Hakwon' (e.g., Korean Association of Child Studies & Hangul Education Research Center, 2002). Private education tends to focus on Hangul decoding, emphasizing alphabet letter name and sound knowledge. Traditionally, however, the CV Gulja chart has long been used as an effective Hangul instruction method from when Hangul was invented to the 1980s when whole word and phonics methods were introduced from Western countries. Recently, the use of the CV chart has been overlooked (Taylor & Taylor, 2014). A typical CV Gulja chart has 14 basic consonant letters in rows (ㄱ, ㄴ, ㄷ, ㄹ, ㅁ, ㅂ, ㅅ, ㅇ, ㅈ, ㅊ, ㅋ, ㅌ, ㅍ, ㅎ) and 10 basic vowel letters (ㅏ, ㅑ, ㅓ, ㅕ, ㅗ, ㅛ, ㅜ, ㅠ, ㅡ, ㅣ) in columns to produce 140 CV Guljas. Young children are used to read and memorize CV Guljas in order (e.g., 가나다라마바사아자차카타파하…). Only later do children learn to read CVC Gulja by adding a coda to the CV Gulja.

Although the three teaching methods referred to above are concurrently used together in Korea, there have been few studies to examine which methods are more effective for teaching Hangul. Among the few existing studies, Cho et al. (2017b) examined literate mediation strategies that Korean mothers often use when individually helping their 4- and 5-year-old children to write Hangul words. The authors identified eight strategies of maternal literate mediation, namely, focusing on the whole Gulja, meaning, visual strokes, holistic visualization, Gulja structure, alphabet letters, CV and coda subsyllabic units. Among the strategies, the coda strategy was mentioned more often by the mothers of 5-year-old children than by those of 4-year-olds. By using the coda strategy, mothers mentioned the letter name of a coda to coach their children to correctly spell the final consonant of a Gulja. Cho et al. (2017b) further demonstrated the unique contribution of the maternal CV strategy to children's independent CV Gulja reading and the unique contribution of the maternal coda strategy to children's word reading after statistically controlling for children's writing skill, vocabulary, and demographics, such as children's age and mother's education. However, other strategies were not associated with Hangul reading. Furthermore, Cho and McBride (2018) developed a Korean scale of maternal literate mediation of children's writing based on six strategies, namely, ordering of the whole Gulja, visual strokes, alphabet letters, Gulja structure, CV, and coda strategies, from lowest to highest. Maternal literate support explained a significant amount of variance in children's word reading and writing concurrently and longitudinally across 1 year after controlling for children's cognitive-linguistic skills and mother's education. It is notable that the whole Gulja strategy was in the lowest level, the letter strategy in the middle, and the CV and coda strategies were in the highest level. The Korean scale is quite different from those of alphabetic and Chinese scripts. Alphabet letter knowledge and radical knowledge were in the highest levels in English- and Hebrew-speaking studies, as well as Chinese studies, respectively (Aram & Levin, 2001; Skibbe, Bindman, Hindman, Aram, & Morrison, 2013; Lin et al., 2009, 2012).

In the Korean maternal literate mediation study by Cho et al. (2017b), mothers adjusted their level of support to fit children's reading ability in the process of parental scaffolding such that mothers of older children mentioned the coda strategy more often than did those of younger children. The maternal coda strategy was linked to children's word reading in their study. In a similar vein, we can anticipate that some strategies might be more available and effective for certain developmental levels of reading skills. For example, Treiman and Rodriguez (1999) separated 5-year old children into two groups based on their reading ability, namely, prereaders, who could not read words but had letter knowledge, and novice readers, who could read English words. In their study, novice readers took advantage of both letter name and sound knowledge in a word learning task, whereas emergent readers used the letter name strategy only. Indeed, Korean young children tend to show great variability in reading skills because some children are taught Hangul at home or by private education companies as early as the ages of 3 or 4 years old. For example, a survey study reported that about 85% of children aged three to five received private education for Hangul reading in 2009 (Cho, 2009b). For this reason, the present study separated 4-year-old children into three groups, namely, emergent readers, novice readers, and good readers, based on their reading ability. Korean emergent readers were defined as those who could read simple CV Guljas. Novices could read some of the regular words, including CV and CVC Guljas, but could not read irregular words. Good readers could read many regular words and some irregular words with sounds that had changed. Note that regular words are those that have consistent letter-phoneme correspondences whereas irregular words are subject to phonological changes according to the Korean phonological system.

Since the three types of instructions focusing, respectively, on whole Gulja, alphabet letters, and CV and coda subsyllabic units, have been used in practice as major Hangul learning strategies, this study examined their effects on Hangul reading in the three groups of emergent, novice, and good readers, respectively. In addition, we included copying instruction because copying has still been used in practice for Hangul acquisition and it appears to facilitate literacy skills in Korean and Chinese studies (Wang et al., 2018). Although writing activities including copying of Guljas via drill and practice have decreased following the impact of Western literacy instructions after the 1980s, a recent survey reported that more than 75% of teachers in Korean kindergartens and preschools teach writing to their children, mostly due to parental request (Choi, 2009c). In a Chinese training study by Wang et al. (2018), copying instruction improved Chinese writing among both the Chinese and non-Chinese speaking children in Hong Kong. Similarly, in a Korean correlational study, Cho (2018) showed that copying skill accounted for significant variance in Hangul word reading and writing, even after statistically controlling for cognitive-linguistic variables among Korean kindergartners.

Purpose of this study

Although diverse Hangul learning instructions such as whole Gulja, letter, CV-coda, and copying have been used in practice in Korea, very few studies have compared the effectiveness of teaching instructions for Hangul reading acquisition for young

Korean children. In the present study, we compared four instructional methods in the three different reading levels of emergent, novice, and good readers among 4-year old children in the Gulja learning task by adapting the Chinese character learning procedure of Wang et al. (2018). In particular, we aimed to test the idea that different learning methods are more or less effective at different reading levels and that beginning learners take advantage of more analytic strategies compared to pre-readers as suggested by reading models and empirical evidence (Defior & Serrano, 2005; Ehri, 1998; Ehri, 2005; Nag & Snowling, 2012; Tong & McBride-Chang, 2010; Treiman & Rodriguez, 1999). We hypothesized that novice readers, who are likely in the partial alphabetic stage according to Ehri's model (Ehri, 1998, 2005) and may be in the stage of acquiring the alphasyllabic principle according to the model of Nag and Snowling (2012), would benefit from an analytic strategy, such as focusing on CV and coda subsyllabic units. We additionally hypothesized that emergent readers, who might be at a more pre-phonological or logographic processing phase (Ehri, 1998, 2005), would particularly benefit from a visual and holistic strategy such as whole Gulja instruction. In addition, we hypothesized that copying would facilitate Hangul learning given a strong correlation between copying skills and Hangul reading and writing in a separate study on kindergartners (Cho, 2018), as well as a strong facilitation of copying practice in Chinese character learning in both Chinese and non-Chinese children in another study (Wang et al., 2018). We did not have a clear hypothesis as to which of the different instructional strategies would be effective across good Hangul readers, however.

Method

Participants

Participants were 45 Korean 4-year-old kindergartners (23 girls and 22 boys). The mean age of these children was 54.44 months ($SD = 3.61$). All of these children were recruited from a single kindergarten in a medium-sized city of Korea with mostly a middle SES background. All the children were native Korean speakers.

Measures

Nonverbal reasoning

The Matrix Analogies Test (MAT)—Short Form (Naglieri, 1985) was administered to test children's nonverbal reasoning skill. This task contains 36 colored patterns of geometric design from which a part is missed. Children select the best option from five or six alternatives to complete the pattern. The test was stopped if the child made five consecutive mistakes. The maximum score was 36 in this task. Cronbach's alpha reliability coefficient was .91 in this study.

Vocabulary knowledge

To control for basic verbal ability, we created a 20-item expressive vocabulary test, which is of a similar format to the Korean Wechsler Intelligence Scale for Children (Kwak, Park, & Kim, 2001). Children were asked to orally explain items (objects or concepts). Each answer was scored from 0 to 3 according to our scoring scheme. Children received 0 points in the case of no answer or incorrect answers; 1 point was given in the case of making a compound word with a target word; 2 points were given when making an appropriate sentence with the target word; 3 points were allotted for the correct definition. For example, in the case of 'key,' 1 point was given for the answer of 'car key;' 2 points were awarded for an answer such as 'start a car with a key'; 3 points were allotted for an answer such as 'A key locks and opens a door.' This test ended when children scored a zero across five consecutive trials. Cronbach's alpha for this test was .74.

Hangul word reading

A Hangul reading subtest of Korean Test of Literacy Diagnosis (K-TOLD) (Cho, Kim, & Park, 2017) was administered. The task was developed for kindergartners and elementary school children. A list of 96 words, arranged from easier to more difficult items, includes 11 words consisting of one- or two-syllables with CV at the beginning of the list, 23 regular words with two- or three-syllables with CV and CVC in the middle, and 62 irregular words with two- or three-syllables with CV, CVC and CVCC at the ends. Irregular words toward the end tend to be unfamiliar and difficult to read due to the application of multiple phonological alternations. For example, 굳이 /gud.i/ 'obstinately' is pronounced as 구지 /gu.ʤi/ due to the application of resyllabification and palatalization. Children were asked to read each word aloud. One point was given for reading a word correctly. The task was stopped if the child failed to read 5 consecutive items. The maximum score was 96. Cronbach's alpha obtained in this study was .99.

Consonant- and vowel-letter knowledge

Children were tested on the three tasks of 19 consonant names, 19 consonant sounds, and 21 vowel names/sounds. The consonant letters include 14 basic and 5 doubled consonants, and the vowel letters consist of 10 basic and 11 compound vowels. Note that vowel letter names are the same as sounds in Korean. In each task, basic letters were first presented to children earlier than compound or doubled letters, and the letters were presented in a random order in either basic or compound letters. The first three items of each task were presented with feedback. The maximum score was 19 for the consonant name, 19 for the consonant sound, and 21 for the vowel name/ sound conditions. Cronbach's alpha reliability coefficients obtained in this study

were .97, .94, and .98 in the consonant name, consonant sound, and vowel name/sound conditions, respectively.

Procedure

Each child participated in five sessions over a 3-week period and was tested individually in a quiet room of his or her school by one of four psychology major graduate students. Each session lasted from 10 to 30 min. In Session 1, the children were tested on Hangul reading, as well as letter-name and letter-sound knowledge, nonverbal reasoning, and vocabulary. There were four different Gulja learning conditions: whole Gulja, letter, CV-coda, and copying. The children participated in all four learning conditions in sessions 2–5. Each child was tested by the same experimenter for all four learning conditions in sessions 2–5 to eliminate a possible confounding effect of experimenters with instructions. The order of the four conditions was balanced by employing a 4×4 balanced Latin Square Design where each row represents experimenters and each column represents learning sessions (Elmes, Kantovits, & Roediger, 2006). Note that a Latin Square design provides an efficient method for counterbalancing a treatment factor and an order variable when the treatment factor has four or more levels. Each experimenter tested from 9 to 13 children.

There were four stimulus sets that were used across the four different learning conditions. The four stimulus sets were equally assigned to each learning condition. In other words, all stimulus sets were used across all learning conditions within this experiment. A different stimulus set was used for each learning condition for a given child. Each stimulus set included 6 Guljas with the number of strokes being between 6 and 18 (e.g., 억 /ək/, 돋 /dod/, 삯 /sag/, 뺄 /p'æl/, 찮 /tʃan/). Items used in the four stimulus sets were developed in a pilot test where 7 kindergartners aged 4 were tested in their reading of Guljas. We first selected 50 Guljas that are not likely to be familiar to children but are actually used in the Korean language such that each Gulja is not a one-syllable word but is only used as a part of a word as an affix or a stem; Gulja structures were either CVC or CVCC. We finally selected 24 Guljas whose average reading performances were between 25 and 75% and evenly assigned 6 items to each stimulus set. All items are available from the first author upon request. To ensure training fidelity, experimenters followed a protocol that was written in a booklet for each Gulja of each leaning condition in order to prompt them to follow exactly the same procedure. Verbal instructions, demonstrations, and feedback to students were scripted.

The children were divided into three groups based on their reading performances in the Hangul word reading test and in the initial reading of Gulja learning task. Definitions of the three groups are as follows: The 15 *emergent readers* could read one-syllable words with simple CV Gulja comprised of a basic consonant and a basic vowel in the Hangul word reading test ($M = 1.40$, $SD = 1.96$) but they could not read any Gulja composed of CVC or CVCC in the initial reading of the Gulja-learning task ($M = 0$, $SD = 0$). Note that all Guljas used in the Gulja-learning task were comprised of CVC or CVCC patterns. The 18 *novice readers* could read multi-syllable regular words with CVC Guljas in the word reading test ($M = 11.44$, $SD = 6.89$) or

they could read at least one Gulja in the initial reading of the Gulja-learning task ($M=5.56$, $SD=4.09$). The twelve *good readers* could read multi-syllable regular Hangul words as well as irregular words with CVC and CVCC Guljas in the word reading test ($M=47.33$, $SD=19.83$) and they could read at least one Gulja in the initial reading of the Gulja-learning task ($M=15.58$, $SD=5.53$). Means and standard deviations of each task for each group are shown in Table 1.

The procedure for the Hangul Gulja learning conditions was as follows: First, the experimenter introduced each Gulja to the children and asked them to read each Gulja to check the extent to which children could read each Gulja initially. Then, the experimenter read the Gulja and demonstrated how the Gulja could be used in a word. For example, for "뺄" /p'æl/ and "삯" /sag/, the experimenter showed each Gulja, pronounced it, and then said that the Gulja is used in the word of "뺄셈" (subtraction) and "뱃삯" (boat fare), respectively. The first part took about 30 s.

Second, the experimenter taught each Gulja based on the learning condition assigned. In the whole Gulja condition, the children were asked to look at and say the new Gulja (i.e., "뺄" /p'æl/ or "삯" /sag/) for 30 s. Each Gulja in this condition was written in black. The teaching segment for each Gulja across each condition took 1 min, including the time for the introduction of each Gulja. In the letter condition, the experimenter said all the letter names, for example, "뺄" has 'ssang bi eub' for the first consonant name, 'ae' for the middle vowel name and 'li eul' for the last consonant name by pointing at each letter. In the case of CVCC Gulja, "삯" has 'si

Table 1 Mean number of correct responses and *F* value for the effect of reading level for each task

Task	Reading level						$F(2, 42)$
	Emergent readers ($N=15$)		Novice readers ($N=18$)		Good readers ($N=12$)		
	M	*SD*	*M*	*SD*	*M*	*SD*	
Reading and cognitive-linguistic tasks							
Age (months)	54.07	3.28	54.28	4.17	55.17	3.27	.33
Hangul reading (96)	1.40	1.96	11.44	6.89	47.33	19.83	61.68***
Vocabulary (60)	14.30	5.35	15.44	7.22	19.25	6.97	2.00
Consonant name (19)	1.87	3.11	11.11	6.52	12.67	6.36	15.96***
Vowel name/sound (21)	1.13	2.53	4.06	4.56	8.75	6.02	9.72***
Consonant sound (19)	.00	.00	2.17	5.08	7.33	8.21	6.61**
Nonverbal reasoning (36)	5.13	3.81	8.18	5.39	12.67	6.96	6.48**
Reading in the Gulja learning task							
Initial reading (24)	.00	.00	5.56	4.09	15.58	5.53	55.40***
Whole Gulja (30)	7.87	6.55	20.22	7.08	28.92	1.51	43.42***
Letter (30)	4.53	6.15	19.67	8.24	26.58	5.33	37.32***
CV-coda (30)	5.87	5.13	23.94	5.16	27.50	3.75	83.80***
Copying (30)	5.53	5.25	23.39	6.12	27.92	3.82	71.28***

The maximum number of points possible is indicated in parentheses

**$p<.01$; ***$p<.001$

os' for the first consonant name, 'a' for the middle vowel name, and 'gi yeg' and 'si os' for the last consonant names. In this condition, each letter was written in different colors of black, blue, and red to allow for easy pointing by the experimenter. The reason for using the letter names of consonants rather than letter sounds was that 4-year old Korean children have very little knowledge of consonant letter sounds but considerable consonant name knowledge (Cho, 2009a). In the CV and coda condition, the experimenter said that "뺄" has "빼" /p'æ/ for the CV part, and 'li eul' for the last consonant name by pointing to the corresponding part. In the case of "샀", /sa/ for the CV and 'gi yeg' and 'si os' for the last consonant names were highlighted by the experimenter. In this condition, the CV part and coda were written in different colors of black and red, respectively. Note that children were taught with consonant letter names of a coda rather than letter sounds for the same reason as that of using consonant letter names as in the letter condition. In addition, when using a coda strategy in maternal literate mediation studies, Korean mothers mentioned consonant letter names of codas to help their children correctly spell them (Cho et al., 2017b; Cho & McBride, 2018). In the copying condition, children were asked to write each Gulja correctly in a notebook printed with the dotted Gulja within a grid for at most three times to facilitate memory. Each Gulja was written in black in this condition.

After 6 Guljas in each condition had been taught, children were tested in Gulja reading. Children saw each of the 6 Guljas as originally printed with color highlights and were asked to read them. If the children could not read the Gulja, then they learned the Gulja with the same instructional method assigned as in the learning condition. If children correctly read a Gulja, they then were not taught it anymore with the learning procedure assigned but proceeded to the next Gulja. Children were asked to continue learning the Gulja until they got the pronunciations of all Guljas correct or until the experimenter had gone through the total teaching trials (5 times). Six Guljas were presented in different orders across 5 trials. Scores were given based on whether a child read a Gulja correctly. One point was given if a child read a Gulja correct, and 0 points were given for incorrect reading. Each condition had 6 Guljas across 5 total trials; thus, the maximum point for each condition was 30.

Results

Table 1 shows the total scores across groups for all the measures administered in this study and F value for the effect of reading level for each task. Children's age was not significantly different across groups. All the cognitive-linguistic tasks except for vocabulary knowledge showed significant group differences. According to post hoc comparisons with a protected t test procedure, in particular, for consonant naming, novices performed better than emergent readers [t (31) = 5.02, $p < .001$], but novices and good readers were not significantly different from each other. For consonant sound knowledge, emergent and novice readers were not different but good readers outperformed novices [t (28) = 2.14, $p < .05$]. For vowel name/sound knowledge, good readers outperformed novices [t (28) = 2.43, $p < .05$], who outperformed

emergent readers [t (31) = 2.21, $p < .05$]. MAT nonverbal reasoning skills were different between good and emergent readers [t (25) = 3.58, $p < .001$]. In addition, initial reading and learning performances in all four conditions of the Gulja learning task showed significant group differences.

Figure 1 shows the mean number of correct responses in the Gulja-learning task as a function of condition (whole Gulja, letter, CV-coda, and copying) and trial (1 through 5) at each of the three reading levels. Note that the experimenter variable was not significant in Gulja learning in the main effect, $F < 1$, and its interaction with condition, $F = 1.55$; thus we excluded the experimenter variable in further analyses. A split-plot factorial ANOVA design was used to analyze the Gulja-learning data with three factors where group was a between-subject variable but condition and trials were within-subject variables. There was a main effect of condition, F (3, 126) = 4.04, $MSe = 2.38$, $p < .01$, $\eta^2 = .09$. Post-hoc multiple comparisons showed that children performed worse in the letter condition than in the whole-Gulja [t (44) = 6.01, $p < .001$], CV-coda [t (44) = 7.39, $p < .001$], and copying [t (44) = 6.69, $p < .001$] conditions. There was a significant interaction effect of condition with reading level, F (6, 126) = 2.98, $MSe = 2.38$, $p < .01$, $\eta^2 = .12$. The main effect of reading level was also significant, F (2, 42) = 72.62, $MSe = 19.69$, $p < .001$, $\eta^2 = .78$, reflecting the big difference in reading performances across the three reading levels. In addition, there were a significant main effect of trial, F (4, 168) = 51.28, $MSe = .82$, $p < .001$, $\eta^2 = .55$, and a significant interaction effect of trial with reading level, F (8, 168) = 3.59, $MSe = .82$, $p < .001$, $\eta^2 = .15$. However, there was no significant interaction between condition with trial, $F < 1$, and no three way interaction, $F = 1.14$.

The significant interaction effect of condition with reading level was further analyzed with follow-up planned comparisons. These data are shown in Fig. 2. For emergent readers, the effect of condition was marginally significant although it did not reach conventional levels of significance, F (3, 42) = 2.64, $MSe = 11.09$, $p = .062$, $\eta^2 = .16$. The effect of condition was significant in novice readers, F (3, 51) = 6.93, $MSe = 12.26$, $p = .001$, $\eta^2 = .29$, but it was not significant in good readers, $F < 1$. Post hoc multiple comparisons showed that the emergent readers performed significantly better in the whole Gulja condition than in the letter condition, t (14) = 2.74, $p < .05$.
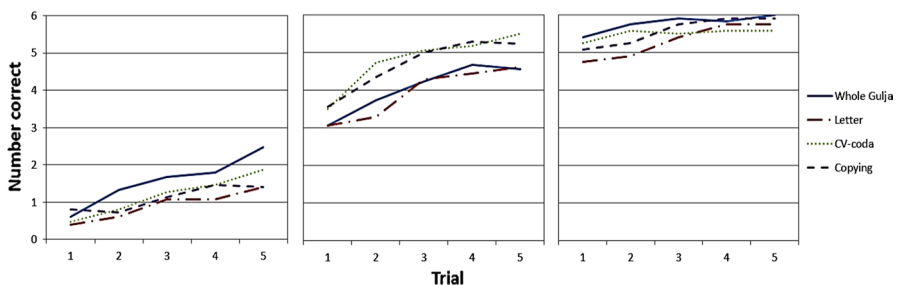

Fig. 1 Number of correct responses in the Hangul Gulja learning task as a function of reading level, trial and condition in emergent readers (left panel), novice readers (middle panel), and good readers (right panel)
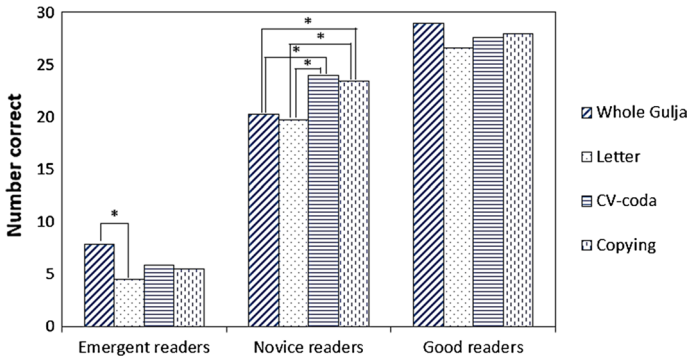
Fig. 2 Number of correct responses in the Hangul Gulja-learning task as a function of reading level and condition. A star (*) indicates a significant difference between two conditions in multiple comparisons

The novice readers performed better in the CV-coda condition than the whole Gulja [t (17) = 3.19, $p < .001$] and letter [t (17) = 3.67, $p < .001$] conditions. Similarly, novice readers performed better in the copying condition than the whole Gulja [t (17) = 2.71, $p < .05$] and letter [t (17) = 3.19, $p < .001$] conditions. In the good reading group, there were no differences across conditions.

Discussion

The aim of the current study was to compare potentially effective learning methods among the four instructions of whole Gulja, letter, CV-coda, and copying in the Hangul Gulja-learning task among 4-years old Korean children. Children were divided into three reading levels of emergent, novice, and good readers based on the great variability of their reading skills. There was a significant main effect of instruction; further analyses showed that the letter condition yielded a lower performance than the other three conditions of whole-Gulja, CV-coda and copying in the participating children. The significant interaction effect of condition with reading level showed that effective Hangul learning strategies depend on children's reading skills. Specifically, whole-Gulja and CV-coda instructions were effective in the emergent and novice readers, respectively. Additionally, copying instruction facilitated Gulja learning in novice readers. However, there were no reliable differences among the four learning conditions among good readers. More detailed discussion follows below.

In this study, the most effective learning strategy differed depending on children's reading level. Emergent readers likely made use of a holistic strategy of whole Gulja to learn to read each new Gulja, which fits well with Ehri's (1998) stage model on the acquisition of alphabetic writing systems. Emergent readers might be in a logographic or pre-phonological stage according to the stage model where learners would benefit from the visual and holistic strategy such as whole Gulja instruction in the Gulja-learning task (e.g., Ehri & Wilce, 1985). On the other hand, the analytic method of splitting a Gulja into CV Gulja and coda units facilitated Gulja learning

in novice readers. In this study, emergent readers could read each simple CV Gulja with a basic consonant and vowel whereas novice readers could read regular words composed of CV and CVC Guljas. Novice Hangul readers, by definition, have more knowledge of CV Guljas and Gulja structure than emergent readers. Novice readers might be in the partial-alphabetic or alphabetic stage according to the stage model (e.g., Ehri & Wilce, 1985) where they could benefit from an analytic strategy such as focusing on CV and coda subsyllabic units. On the other hand, emergent readers could not benefit from CV and coda instruction to learn to read new Guljas. With increased Hangul learning experience, novice readers can analyze each Hangul Gulja into CV and coda units and make use of CV Gulja knowledge when they decode new Hangul Guljas. Similar to these findings, mothers' teaching instructions focused on whole Guljas and CV/coda subsyllabic units were in the lowest and the highest levels, respectively, in a Korean scale of maternal literate mediation strategies, and the mother's high score on the scale was positively linked to children's reading and writing longitudinally (Cho & McBride, 2018).

In a similar vein, American and Chinese 5-year old children could benefit from analytic letter name and sound knowledge in performing an English word learning task regardless of native language (McBride-Chang & Treiman, 2003; Treiman & Rodriguez, 1999). Likewise, in the Chinese study by Wang et al. (2018), native Chinese children took advantage of an analytic strategy focusing on radical knowledge in the Chinese character learning task. More similar to Korean novice readers, readers of alphasyllabic Kannada develop alphasyllabic strategies by mapping between orthographic and phonological units at both levels of syllable and phoneme (Nag & Snowling, 2012). Thus, beginning learners tend to make use of analytic approaches appropriate to a target orthography such as letter name and sound knowledge, radical knowledge, akshara-phoneme markers, and CV syllable—phoneme coda knowledge in learning in English, Chinese, Kannada, and Korean orthographies, respectively. The analytic process is a universal aspect of reading development across languages (Byrne, 1998; McBride-Chang & Treiman, 2003; Nag & Snowling, 2012; Tong & McBride-Chang, 2010; Treiman & Rodriguez, 1999; Yin & McBride, 2015).

Copying instruction facilitated reading of new Gulja in novice Hangul readers in this study. This result is similar to the finding from a study of Chinese learning by Wang et al. (2018). Compared to the present study, that Chinese study included children who were quite different in age (4 years olds vs. 2nd and 3rd graders), native language (Korean vs. Chinese and non-Chinese), and the script that children were learning (Korean Gulja vs. Chinese characters). In the Chinese study, copying skills produced a significant increase in writing of Chinese in both native and non-native L2 (second language) learners as compared to other learning strategies. In other Chinese studies, copying facilitated Chinese character reading in adults' learning of L2 Chinese (Guan, Liu, Chan, Ye, & Perfetti, 2011) and a combined intervention program of copying with morphological awareness improved Chinese word reading and writing in kindergartners (Wang & McBride, 2017). In addition, in a training study of English-speaking adults with a semi-artificial orthography, copying improved learning of alphasyllabic akshara symbols used for Hindi and other Indic languages (Bhide, 2018). As suggested by previous studies, copying might enhance the formation of internal structure knowledge of Chinese characters and akshara

symbols, and memorization of their configuration. Even for 4-year-old young children in this study, copying might also strengthen internal structure and orthographic knowledge of Hangul Gulja and enhance memorization. Thus, copying appears to be a useful technique to use to teach Hangul as well as Chinese characters and akshara for beginning learners.

Regarding Korean alphabet letter knowledge in this study, good readers had better consonant letter sound knowledge than novice readers, who had better letter name knowledge than emergent readers. Similarly, in the study by McBride-Chang and Treiman (2003), 5-year-old Chinese children in Hong Kong had better knowledge of letter names and sounds in L2 English than younger children, and they took advantage of both letter name and sound knowledge on a L2 English word learning task. On the other hand, Korean children at age 4 in the present study might not have favored utilizing their letter knowledge in the Gulja-learning task because letter instruction yielded an inferior effect on Gulja learning as compared to other instructions. Only novice readers might have used letter name knowledge in the reading of the final consonant of a Gulja because CV-coda instruction facilitated Gulja learning in novice readers and coda was taught with its letter name. In support of this conclusion, novice readers in this study had considerable knowledge of consonant letter names (58%) but low consonant sound knowledge (11.5%). Our results suggest that early Gulja learning may require other skills such as CV syllable and phoneme coda, rather than letter name and sound knowledge (e.g., Cho, 2009a). On the other hand, four types of learning instructions were not significantly different in good readers, which might be due to their ceiling performances of Hangul reading. Alternatively, perhaps good readers can benefit from all of the skills, including copying, sounding out, and memorization.

Reading ability of Korean 4-year-old children varies greatly, from emergent readers who can read only some simple CV Gulja to good readers, who can read regular words as well as irregular words. It is even surprising that the proportion of the three groups in this study was approximately similar by 33%, 40%, and 27% for emergent, novices, and good readers, respectively, among kindergarten year 1 children aged four attending a typical, local kindergarten located in a medium-sized city of South Korea. The big variability in reading skills might be due to the transparent characteristics of the Hangul script and the prevalent private education done at home from the early ages of 3 or 4 years old. Note that about 85% of children aged three to five are explicitly taught about Hangul reading by studying commercial worksheets or studying in private institutions (Cho, 2009b; Korean Association of Child Studies & Hangul Education Research Center, 2002). Perhaps, partly related to this, about 70% of children are already good at Hangul Gulja reading before entering Grade 1 (see, e.g., Cho, 2017 for a review). Indeed, teachers in Grade 1 do not tend to focus on Hangul decoding although Korean children do not officially learn Hangul at kindergartens but are, rather, supposed to learn in elementary school. Possibly, children who are not good at Hangul Gulja reading at the beginning of Grade 1 might not be appropriately taught about Hangul reading from school and they might have higher chances of becoming struggling readers. Our data suggest that teachers, parents, and policy makers should recognize the great variability of children's Hangul

reading skills, identify each child's reading level at least in Grade 1 or earlier, and provide adequate literacy education to children by adjusting teaching instructions to children's reading skills.

The present study had the limitation of containing relatively small samples. We had originally sought one group of 45 children, but we found that children's reading ability varies greatly, and effective instructions depend on children's reading levels. Future research may need to replicate optimal instructions using larger samples of emergent and novice readers. Possible target samples would be children with poor Hangul reading skills, children from multilingual families, and foreign Hangul learners who are adults and adolescents worldwide. In addition, future studies may require intervention for Hangul literacy development in more diverse and combined programs of instructions such as copying and CV-coda.

In conclusion, the current study is among the first to compare optimal methods to learn Hangul Gulja for the three reading level groups of emergent, novice, and good readers among 4-year old children. This study showed the great diversity in Hangul reading skills in 4-years old Korean children from emergent readers to good readers. Findings demonstrate the importance of copying practice in novice readers at the beginning stage of Hangul acquisition. Recently, copying has been demonstrated as a key factor in acquisition of reading and writing of Chinese characters (Guan et al., 2011; Wang & McBride, 2017; Wang et al., 2018) and akshara (Bhide, 2018). Similarly, this study underscores the key role of copying practice in literacy development by expanding to the different language of Korean and to a different sample of very young children aged 4 in Korea. Additionally, our findings have demonstrated that effective learning strategies depend on children's reading levels. For example, whole Gulja instruction was effective for emergent readers who could read only simple CV Gulja. On the other hand, CV-coda instruction, the analytic instruction to break a Gulja into CV and coda units, is useful as a learning tool for novice readers who can read some regular Hangul words. Theoretically, out results fit relatively well with Ehri's stage model on the acquisition of alphabetic writing systems (Ehri, 1999): Emergent readers likely take advantage of a holistic, whole Gulja strategy in a logographic stage, and novice readers tend to utilize a more analytic method in the partial-alphabetic or alphabetic stage (e.g., Ehri & Wilce, 1985; Treiman & Rodriguez, 1999). More strongly, reading strategies of Korean novice readers fit with the alphasyllabic reading model of Kannada in that Korean novice readers might take advantage of dual representation at both the CV syllable and phoneme coda levels (e.g., Nag & Snowling, 2012). Practically, our findings provide evidence for some effective strategies in Hangul literacy development in young Korean children with poor reading skills and perhaps for children from multilingual families. In addition, our findings may be helpful in developing more effective methods to teach Hangul to L2 learners of adults and adolescents at the beginning stages.

References

Aram, D., & Levin, I. (2001). Mother–child joint writing in low SES: Sociocultural factors, maternal mediation, and emergent literacy. *Cognitive Development, 16,* 831–852.

Bhide, A. (2018). Copying helps novice learners build orthographic knowledge: Methods for teaching Davanagari akshara. *Reading and Writing, 31,* 1–33.

Byrne, B. (1998). *The foundation of literacy*. Hove: Psychology Press.

Cho, H. S. (2003). *Perception of kindergarten teachers and parents about reading & writing education for early childhood*. Unpublished master's thesis, Ewha Women's University, Seoul, Korea.

Cho, J.-R. (2009a). Syllable and letter knowledge in early Korean Hangul reading. *Journal of Educational Psychology, 101,* 938–947.

Cho, J.-R. (2017). Early literacy policy and practice in Korea. In N. Kucirkova, C. Snow, V. Grover, & C. McBride (Eds.), *The Routledge international handbook of early literacy education: A contemporary guide to literacy teaching and intervention in a global context* (pp. 200–209). New York, NY: Routledge.

Cho, J.-R. (2018). *Relations of copying skills to Hangul word reading and writing among Korean kindergartners*. Manuscript submitted for publication.

Cho, S.-S. (2009b). *Perception of hangeul studying paper teachers on literacy education for early childhood*. Unpublished master's thesis. Seoul: Kyunghui University.

Choi, S.-S. (2009c). *The actual conditions and the cognition of teachers about childhood writing education*. Unpublished master's thesis, Gwangju University, Gwangju, Korea.

Cho, J.-R., & Ji, Y. K. (2011). Cognitive profiles of Korean poor readers. *Dyslexia, 17,* 312–326.

Cho, J.-R., Kim, Y. S., & Park, S. G. (2017a). *Korean test of literacy diagnosis (K-TOLD)*. Seoul: Korea Guidance.

Cho, J.-R., McBride, C., & Lin, D. (2017b). The relation of maternal literate mediation strategies and socio-emotional comments to Korean children's Hangul reading. *Applied Psycholinguistics, 38,* 155–179. https://doi.org/10.1017/S014271641600014X.

Cho, J.-R., & McBride, C. (2018). Maternal literate mediation of writing and Korean children's reading and writing across 1 year. *Reading and Writing, 31,* 679–701.

Cho, J.-R., McBride-Chang, C., & Park, S. G. (2008). Phonological awareness and morphological awareness: Differential associations to regular and irregular word recognition in early Korean Hangul readers. *Reading and Writing: An Interdisciplinary Journal, 21,* 255–274.

Defior, S., & Serrano, F. (2005). The initial development of spelling in Spanish: From global to analytic. *Reading and Writing, 18,* 81–98. https://doi.org/10.1007/s11145-004-5893-1.

Ehri, L. C. (1998). Grapheme–phoneme knowledge is essential for learning to read words in English. In L. C. Ehri & J. L. Metsala (Eds.), *Word recognition in beginning literacy* (pp. 3–40). Mahwah, NJ: Erlbaum.

Ehri, L. C. (2005). Learning to read words: Theory, findings, and issues. *Scientific Studies of Reading, 9,* 167–188. https://doi.org/10.1207/s1532799xssr0902_4.

Ehri, L. C., & Wilce, L. S. (1985). Movement into reading: Is the first stage of printed word learning visual or phonetic? *Reading Research Quarterly, 20,* 163–179.

Elmes, D. G., Kantovits, B. H., & Roediger, H. L., III. (2006). *Research methods in psychology* (8th ed.). Seoul: Thomson Corporation Korea Limited.

Frith, U. (1985). Beneath the surface of developmental dyslexia. In K. E. Patterson, J. C. Marshall, & M. Coltheart (Eds.), *Surface dyslexia: Neuropsychological and cognitive studies of phonological reading* (pp. 301–330). Hove: Erlbaum.

Guan, C. Q., Liu, Y., Chan, D. H. L., Ye, F., & Perfetti, C. A. (2011). Writing strengthens orthography and alphabetic-coding strengthens phonology in learning to read Chinese. *Journal of Educational Psychology, 103,* 509–522.

Kim, Y.-S. (2007). Phonological awareness and literacy skills in Korean: An examination of the unique role of body-coda units. *Applied Psycholinguistics, 28,* 67–93.

Kim, J., & Davis, C. (2006). Literacy acquisition in Korean Hangul: Investigating the perceptual and phonological processing of good and poor readers. In R. M. Joshi & P. G. Aaron (Eds.), *Handbook of orthography and literacy*. Hillsdale, NJ: Erlbaum.

Korean Association of Child Studies & Hansol Education Research Center. (2002). *Child development report 2001*. Seoul: Hansol Education.

Kwak, K.-J., Park, H.-W., & Kim, C.-T. (2001). *Korean-Wechsler intelligence scale for children*. Seoul: Special Education Publishing Co.

Lin, D., McBride-Chang, C., Aram, D., Levin, I., Cheung, Y. M., Chow, Y. Y., et al. (2009). Maternal mediation of writing in Chinese children. *Language and Cognitive Processes, 24,* 1286–1311.

Lin, D., McBride-Chang, C., Aram, D., Shu, H., Levin, I., & Cho, J.-R. (2012). Maternal mediation of word writing in Chinese across Hong Kong and Beijing. *Journal of Educational Psychology, 104,* 121–137.

Marsh, G., Friedman, M., Welch, V., & Desberg, P. (1981). A cognitive-developmental theory of reading acquisition. In G. E. MacKinnon & T. G. Waller (Eds.), *Reading research: Advances in theory and practice* (Vol. 3, pp. 199–221). San Diego: Academic Press.

McBride, C. (2016). *Children's literacy development*. New York, NY: Routledge.

McBride-Chang, C., & Treiman, R. (2003). Hong Kong Chinese kindergartners learn to read English analytically. *Psychological Science, 14,* 138–143.

Nag, S., & Snowling, M. J. (2012). Reading in an alphasyllabary: Implications for a language universal theory of learning to read. *Scientific Studies of Reading, 16,* 404–423.

Naglieri, J. A. (1985). *Matrix analogies test-Short form*. San Antonio, TX: Psychological Corp.

Park, H.-R., & Uno, A. (2012). Investigation of cognitive ability related to reading and spelling in Korean: Readers with high, average, and low skills levels. *Dyslexia, 18,* 199–215.

Simpson, G. B., & Kang, H. (2004). Syllable processing in alphabet Korean. *Reading and Writing: An Interdisciplinary Journal, 17,* 137–151.

Skibbe, L. E., Bindman, S. W., Hindman, A. H., Aram, D., & Morrison, F. J. (2013). Longitudinal relations between parental writing support and preschoolers' language and literacy skills. *Reading Research Quarterly, 48,* 387–401.

Taylor, I., & Taylor, M. (2014). *Writing and literacy in Chinese, Korean, and Japanese* (Revised ed.). Amsterdam: John Benjamins Publishing Co.

Tong, X., & McBride-Chang, C. (2010). Developmental models of learning to read Chinese words. *Developmental Psychology, 46,* 1662–1676.

Treiman, R., & Rodriguez, K. (1999). Young children use letter names in learning to read words. *Psychological Science, 10,* 334–338.

Wang, M., Cho, J.-R., & Li, C. (2017). Reading acquisition in Korean. In L. Verhoeven & C. Perfetti (Eds.), *Learning to read across languages and writing systems* (pp. 82–103). Cambridge: Cambridge University Press.

Wang, Y., & McBride, C. (2017). Beyond copying: A comparison of multi-component interventions on Chinese early literacy skills. *International Journal of Behavioral Development, 41,* 380–389.

Wang, Y., McBride, C., Zhou, Y., Joshi, M., & Farver, J. (2018). Becoming literate in Chinese: A comparison of native and non-native speaking children. *Journal of Research in Reading, 41,* 511–524. https://doi.org/10.1111/1467-9817.12122.

Yi, K. (1998). The internal structure of Korean syllables: Rhyme or body? *Korean Journal of Experimental and Cognitive Psychology, 10,* 67–83.

Yin, L., & McBride, C. (2015). Chinese kindergartners learn to read analytically. *Psychological Science, 26,* 424–432.

Yoon, H. K., Bolger, D. J., Kwon, O. S., & Perfetti, C. A. (2002). Syllable units in reading: A difference between Korean and English. In L. Verhoeven, C. Elbo, & P. Reitsma (Eds.), *Precursors of functional literacy* (pp. 139–164). Amsterdam: Benjamins.

Ziegler, J., & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory. *Psychological Bulletin, 131,* 3–29.