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A multiple-group comparison on the role of morphological awareness in reading: within- and cross-linguistic evidence from Korean ESL and EFL learners

Han Suk Bae[1] · **R. Malatesha Joshi**[2]

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Abstract The purpose of the present study was to explore the role of morphological awareness in reading comprehension in different language learning contexts (ESL and EFL). Korean ESL and Korean EFL learners (50 and 257 respectively) in grades five and six were administered measures of L2 (English) morphological, phonological, and orthographic awareness (MA, PA, and OA), as well as reading comprehension. The participants' L1 (Korean) MA was also measured. The multiple-group path analysis showed that among both group participants' L2 MA was the greatest predictor for their L2 reading comprehension, when the effect of PA and OA was controlled (within-linguistic perspective). Concerning cross-linguistic perspective, there was a statistically significant difference between the ESL and the EFL groups: the ESL participants' L1 MA played a positive role in predicting their L2 reading comprehension, but not for their EFL counterparts. Educational implications and research recommendations are discussed in relation to MA's contribution to reading comprehension.

Keywords Morphological awareness · Reading comprehension · Transfer · ESL/EFL

✉ Han Suk Bae
hsb.readologist@gmail.com

[1] Department of International Tourism, Dong-A University, 225 Gudeok Ro, Seo Gu, Busan 49236, Korea

[2] Department of Teaching, Learning, and Culture, Texas A&M University, 4232, College Station, TX 77843-4232, USA

Introduction

Previous studies have shown that morphological awareness (MA), the conscious metalinguistic awareness of morphological forms (e.g., free morphemes and affixes), is a unique and significant predictor for reading success in both alphabetic (Carlisle, 2000; Deacon & Kirby, 2004; Goodwin, Huggins, Carlo, August, & Calderon, 2013; Kieffer & Box, 2013; McBride-Chang, Wagner, Muse, Chow, & Shu, 2005b; Nagy, Berninger, & Abbott, 2006) and non-alphabetic languages (Farran, Bingham, & Matthews, 2012; McBride-Chang et al., 2005a, 2008). Across alphabetic and non-alphabetic languages, the positive role of MA has been found in word reading (Cho, Chiu, & McBride-Chang, 2011; Goodwin et al., 2013; Ramirez, Chen, Geva, & Kiefer, 2010; Wang, Ko, & Choi, 2009), vocabulary (Lam, Chen, Geva, Luo, & Li, 2011; McBride-Chang et al., 2008; Wang, Cheng, & Chen, 2006), and reading comprehension (Kieffer & Box, 2013; Kieffer & Lesaux, 2008, 2012a; Mahfoundhi, Elbeheri, Al-rashidi, & Everatt, 2010). Additionally, the positive role of MA in literacy outcomes has been consistently proven regardless of whether the learners were monolingual, second language, or foreign language learners of the target language.

In recent years, interest in understanding the cross-linguistic role of MA in literacy development has increased (Cho et al., 2011; Hu, 2013; Pasquarella, Chen, Lam, Luo, & Ramirez, 2011; Ramirez, Chen, & Pasquarella, 2013; Wang et al., 2006, 2009). One of the key findings from existing literature is that a well-developed ability to process morphological information in one language may facilitate reading comprehension in additional languages. Ramirez et al. (2013) showed that Spanish ESL learners' L1 (Spanish) derivational MA was positively transferred to their L2 (English) reading comprehension. According to Pasquarella et al. (2011) and Wang et al. (2006), Chinese ESL learners' L2 (English) compound MA was predictive of their L1 (Chinese) reading comprehension. These findings shed light on the notion that positive cross-linguistic MA transfer not only occurs between similar writing systems (e.g., Spanish and English), but also between different writing systems (e.g., Chinese and English).

Little has been investigated, however, with regard to the contextual differences of language learning in explaining the MA effect on reading comprehension. English as a second language (ESL) or foreign language (EFL) is one of the distinct contexts of language learning (Carter & Nunan, 2001; Ellis, 2008). Despite consistent evidence finding that English MA is a unique predictor for both ESL and EFL students' English reading comprehension (Jeon, 2011; Kieffer & Box, 2013; Kieffer & Lesaux, 2008, 2012a; Zhang & Koda, 2012, 2013), none of these previous studies have included both groups of students simultaneously to compare whether the MA effect on the outcome variable is equally important for both groups. Moreover, no studies, to our knowledge, have empirically tested whether the cross-linguistic MA effect on reading comprehension would be similar or different when the ESL and EFL group students have the same L1 background.

The purpose of the present study, therefore, was to explore the role of MA in reading comprehension among students in different language learning contexts

(ESL and EFL) who speak the same L1 (Korean). Specific focus was given to comparing group differences between the ESL and the EFL learners with regard to the direct effect of MA on reading comprehension; the indirect effect of MA on reading comprehension mediated by vocabulary; and the cross-linguistic effect of MA on reading comprehension, once controlled for other predictors of reading (i.e., phonological and orthographic awareness; PA and OA). Within- and cross-linguistic multiple-group path models were specified, the path of interest was fixed one at a time, and a Chi square difference test ($\Delta\chi^2$) was conducted.

Contextual differences of language learning: ESL versus EFL

The environmental context of learning English is not the same across separate countries, but there is no preferred method of categorizing those differences. One well-approved approach is Kachru's three circles (1989): inner, outer, and expanding. The inner circle represents countries that use English as a first language such as Australia, Canada, New Zealand, the U.K., and the U.S. The outer circle consists of multilingual countries such as Hong Kong, India, Singapore, and Rwanda where English is used as a second language. The expanding circle includes countries where English is used as a foreign language for specific academic or business purposes, including China, Denmark, Germany, Japan, Korea, and Norway.

Recent views on categorizing English learning contexts does not follow national or political boundaries, but rather uses a more general approach to describe the communicative function of English use. For example, Carter and Nunan (2001) define the ESL environment the countries, contexts, and cultures where English is a predominant language of communication, while EFL refers to areas where English is neither a medium of communication nor a language of instruction. According to Ellis (2008), in ESL environments, English plays an institutional and social role in the community; in EFL conditions, English plays no major role in community and is primarily learned only in the classroom.

The present study primarily categorizes ESL and EFL contexts based on multiple factors, such as language of communication and institutional and societal language. First, English is a dominant language of communication and instruction for ESL learners, while it is their first language (L1) for EFL learners. Second, ESL learners use English as their institutional and social language, whereas EFL learners use their L1. Accordingly, the amount of print exposure in each language may not be equivalent between the two groups: dominant L2 (English) literacy input for the ESL group; prevalent L1 literacy input for the EFL group.

Within-linguistic MA effect on reading comprehension

The metalinguistic hypothesis (Nagy, 2007) suggests that some of the shared variance between vocabulary and reading comprehension is explained by the role of metalinguistic awareness, a term which refers to the identification, analysis, and manipulation of language forms (Koda, 2005). Recent studies have provided consistent evidence that MA is one of the important metalinguistic skills that can

predict success in learning to read English, not only for ESL learners, but also for EFL learners (Goodwin et al., 2013; Jeon, 2011; Kieffer & Box, 2013; Kieffer & Lesaux, 2008, 2012a; Zhang & Koda, 2013). For example, Kieffer and Lesaux (2012a) compared sixth graders with different language backgrounds, including Spanish, Filipino, and Vietnamese-speaking ESL students, in addition to monolingual English-speaking children. Based on multiple-group structural equation modeling analysis, the direct MA effect on reading comprehension was found across all language groups. Zhang and Koda (2013) also found positive contributions of MA to reading comprehension among sixth-grade Chinese EFL learners. Multiple regression analysis showed that the participants' knowledge of derivational morphology explained a unique variance of English reading comprehension, after controlling for the effects of nonverbal intelligence, grammatical knowledge, vocabulary knowledge, and inflectional morphological awareness.

As Kuo and Anderson (2010) suggested, one benefit of learning to read two languages concurrently is that learners can easily discern and manipulate structural similarities and differences across languages (i.e., the structural sensitivity theory). However, ESL and EFL learners have distinct amount of L1 and L2 literacy input while learning to read two languages in very different language learning contexts, and they may not have the equivalent ability to process language forms in each language. Even though current research has shown MA is a unique predictor for both ESL and EFL students' literacy development (Goodwin et al., 2013; Jeon, 2011; Kieffer & Box, 2013; Kieffer & Lesaux, 2008, 2012a; Zhang & Koda, 2012, 2013), none of these studies have included both groups of students simultaneously and compared whether the magnitude of the MA effect on reading comprehension in English is equally important. For a more comprehensive understanding of the role of MA in literacy development, contextual differences of language learning must also be considered for empirical investigation.

One notable point from the previous studies is that the MA contribution to reading comprehension was both direct and indirect which is mediated by vocabulary. Nagy et al. (2006) found that both the direct path (i.e., from MA to reading comprehension) and the indirect path (i.e., from MA to reading comprehension via vocabulary) were statistically significant for students from fourth to ninth grade. Kieffer and Box (2013) provided evidence that sixth-grade Spanish ESL learners' MA showed both direct and indirect effect on their reading comprehension. Similar patterns of direct and indirect effect were identified among Vietnamese and Filipino ESL learners (Kieffer & Lesaux, 2012a); however, the relative magnitude of the effect was different according to the students' L1 background: the Vietnamese ESL learners showed greater direct and indirect effect than Filipino ESL students. However, Zhang and Koda (2012) presented slightly different findings for the EFL students. Chinese EFL students in their study showed only indirect effects of derivational MA on reading comprehension in English which was mediated by English vocabulary. The direct effect of derivational MA on reading comprehension was not statistically significant, whereas ESL learners consistently showed both direct and indirect effect of derivational MA on reading comprehension in English (Goodwin et al., 2013; Kieffer & Box, 2013; Kieffer & Lesaux, 2008, 2012a; Nagy et al., 2006; Ramirez et al., 2013). However, the

participants in Zhang and Koda (2012) study were university-level students, whereas most other studies were conducted with students in upper elementary (fifth and sixth grades) level. Thus, more investigation with upper elementary EFL learners is needed to determine whether the contribution of MA to reading comprehension has both direct and indirect effect in that age group. By considering both ESL and EFL learners simultaneously, the direct and indirect effect can be tested across the two groups.

Cross-linguistic MA effect on reading comprehension

Regarding the cross-linguistic contribution of MA to reading comprehension, one noteworthy point from studies on ESL learners is that positive cross-linguistic transfer occurs regardless of whether L1 and L2 have similar or different writing systems. For example, both English and Spanish are alphabetic writing systems where phonemes are mapped onto graphemes or letters. The Chinese writing system, however, is morpho-syllabic, where combinations of signs in syllabic units represent words or concepts. Empirical evidence to support positive cross-linguistic transfer has been found not only in Spanish ESL children (Ramirez et al., 2013), but also in Chinese ESL children (Pasquarella et al., 2011; Wang et al., 2006).

Wang et al. (2009) conducted one of the few studies that examined cross-linguistic contributions of MA to reading in Korean ESL students. It was found that derivational MA was transferred to word reading cross-linguistically (i.e., from Korean MA to English word reading and from English MA to Korean word reading), but did not show any statistically significant effect on their reading comprehension. However, the participants in the Wang et al. study (2009) were students from grades two to four who may not have mastered the concept of derivational morphology. Studies by Berninger, Abbott, Nagy, and Carlisle (2010) and Kieffer and Lesaux (2008) have shown that both monolingual English-speakers and ESL students exhibited a similar developmental trend in MA, indicating that derivational MA may develop in upper elementary grades (e.g., fifth-grade), while inflectional and compound MA may develop in earlier grades.

With regard to EFL learners, recent studies have shown that MA in one language positively transferred to literacy skills in another (Cho et al., 2011; Hu, 2013). For example, Korean EFL learners' L1 (Korean) MA was positively transferred to their L2 (English) word reading (Cho et al., 2011). In addition, Taiwanese EFL learners accessed their L1 (Chinese) MA for L2 (English) word reading (Hu, 2013). However, the scope of these studies was limited to investigations at the word level, and therefore, there is a need for further research to examine cross-linguistic MA-reading comprehension associations among EFL learners. Furthermore, no cross-linguistic studies have included both ESL and EFL students simultaneously nor examined how the two student groups utilize their L1 MA as a resource to enhance their L2 reading comprehension.

According to the transfer facilitation model (Koda, 2008), L2 competencies continuously mature through the interactions between transferred L1 metalinguistic awareness and L2 print input. If L1 and L2 are morphologically similar languages, the students' prior experience of processing L1 morphological information would be

a useful resource in analyzing and making morphologically-complex L2 words. The students may need less print input in processing the target L2 morphological structure in this case. However, if both L1 and L2 are morphologically distinct languages, the students' L1 MA would not be useful, and hence, they may need more extensive L2 print input to understand and manipulate the target L2 morphologically-complex words.

Korean *Hangul* and English share similar morphological structures in making derivational and compounding words. In English, *width* can be derived from *wide* and *-th,* which is a derivational noun suffix. Similarly, *넓이/nul.bi/ which means width in Korean Hangul, is derived from 넓다/nul.dda/, which means wide by adding derivative noun suffix -이/i/. As far as compound word formation is concerned, both Korean Hangul and English are right-headed languages where the free morpheme on the right side is the head and the one on the left is a modifier. For example, a ball game using a basket is not called ballbasket, but called basketball in English. The compound word for basketball in Korean Hangul is 농구/nong. gu/, not 구농/gu. nong/, where 농/nong/ means basket and 구/gu/ means ball. Thus, based on the transfer facilitation model, it can be hypothesized that English (L2) learners from a Korean L1 background may have positive cross-linguistic transfer from their L1 MA to L2 literacy development.*

According to the interdependence hypothesis (Cummins, 1981, 2000), adequate L1 cognitive academic linguistic proficiency and adequate L2 language input are necessary for positive cross-linguistic transfer. This hypothesis also suggests the importance of a threshold level of L2 proficiency for the language learners (i.e., the threshold hypothesis). That is, positive cross-linguistic L1 transfer does not occur until the learners have appropriate levels of L2 competency as a result of experiencing adequate L2 literacy input. Students in ESL contexts may have more exposure to English print input than their EFL counterparts. Additionally, ESL learners have extensive English instruction at school, whereas EFL learners may only receive a limited amount of time for instruction. Without extensive English literacy support from home, EFL learners may not have equivalent levels of L2 competency as their ESL counterparts. Thus, even though Korean and English share similar morphological structures and students' knowledge on processing Korean morphological structures may facilitate their English literacy development, the present study hypothesizes that the degree of cross-linguistic MA transfer to reading comprehension would not be the same between the Korean ESL and EFL students.

Research questions addressed in the study are:

1. Is the direct contribution of MA to reading comprehension significantly different between the ESL and EFL groups?
2. Is the indirect contribution of MA to reading comprehension mediated by vocabulary significantly different between the two groups?
3. Is the cross-linguistic contribution of MA to reading comprehension significantly different between the groups?

Methodology

Participants

The total number of participants for this study was 307 (50 Korean ESL and 257 Korean EFL students) comprised of 153 fifth graders and 154 sixth graders. The Korean ESL learners were in the U.S., while the Korean EFL learners were in Korea. In the U.S., English is the dominant language of communication and is used as a societal and institutional language, while Korean is an ethnic group language. In contrast, Korean is the social and institutional communication used in Korea, and English is taught and learned only for specific academic or business purposes (e.g., university entrance exam or job interview).

Korean ESL learners

The Korean ESL learners were recruited from eight Korean language schools in the southern Texas area. Initially, 52 children voluntarily participated with consent of their parents. Two children were excluded because they had been in the U.S. for less than 6 months. The final sample amounted to 50 Korean ESL learners—23 fifth and 27 sixth graders (17 boys and 33 girls). On weekdays, the Korean ESL learners attend English schools, but on weekends, they attend Korean language schools. The Korean language school is a volunteer-run community organization, and its main curriculum is based primarily on the textbooks provided by the Educational Foundation for Koreans Abroad. Textbook units consist of communicative functions, such as greeting, asking for help, shopping, suggesting, comparing, and planning schedules. Each unit includes a short paragraph or dialogue reading, listening and speaking games and activities, and composition practices (e.g., writing a letter, a diary entry, a descriptive or reflective journal, etc.). These Korean instructions last for about 2 or 3 h a week in the Korean language schools and other special activities (e.g., club activities or field trips) are provided as extra curriculum.

A parental questionnaire was administered to obtain information about the participants' demographics and time spent learning the language. Unanswered items in the questionnaire were regarded as missing data. The mean age of the participants was 140.5 months ($SD = 7.6$ months) and they resided in the U.S. for 111.4 months ($SD = 30.6$ months) on average. The average length of time studying English ($M = 76.8$ months and $SD = 25.0$ months) was longer than that of studying Korean ($M = 49.3$ months and $SD = 34.1$ months).

Korean EFL learners

Due to cultural differences in conducting research in Korea, the waiver of parental consent form was obtained based on a letter of cultural authority, and potential Korean EFL participants were recruited with their consent to the assent form. Approximately 300 students in grades five and six across four public elementary schools in Seoul, Korea were invited to participate in the study and 257 students

voluntarily consented to participation. Since the participants came from similar neighborhoods, their SES could be considered as middle class. There were 130 fifth and 127 sixth graders (130 boys and 127 girls). The participants had at least 2 years of English instruction in school previously, due to English being a required subject from third grade in Korean elementary schools. At the time of the present study, the participants had 120 min of English lessons per week at school.

A student survey was administered to obtain background information about the Korean EFL participants. The items in the survey were similar to those in the parental questionnaire in the Korean ESL sample, but were presented with student-friendly language for the students themselves to complete. Unanswered items in the questionnaire were regarded as missing data. Most of the participants were born in Korea (98.4%) and the mean age of the participants was 138.0 months ($SD = 7.6$ months). The average length of time studying Korean ($M = 95.1$ months and $SD = 38.0$ months) was longer than that of studying English ($M = 53.1$ months and $SD = 28.2$ months).

Measures

English PA (EPA)

Awareness of the phonemic unit[1] is one of the most significant factors for predicting word reading and reading comprehension among elementary students (Gottardo, Stanovich, & Siegel, 1996; McBride-Chang, 1996; Wagner, Torgesen, & Rashotte, 1994). Phoneme deletion and phoneme segmentation were used to measure the PA: One-syllable-word test items were randomly selected from previous research (Jongejan, Verhoeven, & Siegel, 2007), and there were 10 phoneme deletion and 10 phoneme segmentation items in the present study. For the phoneme deletion task, participants listened to a monosyllabic non-word item and were asked to delete one phoneme from the word and choose the appropriate number (i.e., 1, 2, or 3) on the answer sheet (Now listen, *mab*. How would this word sound without/b/?; 1./ab/, 2./mab/, or 3./ma/?). For the phoneme segmentation task, participants were asked to listen to a real word item and write the number of phonemes in the word on the answer sheet (The word *cat* has 3 speech sounds /k/,/a/,/t/).

English MA (EMA)

Two morphological production tasks were adapted from previous studies to evaluate the EMA: derivational and compound production tasks. To measure the derivational production, 10 test items were selected from Carlisle (2000). This is a commonly utilized task across multiple studies to measure ESL learners' derivational morphological awareness (Pasquarella et al., 2011; Ramirez et al., 2010, 2013; Wang et al., 2009), and several studies provided evidence for the validity of the task

[1] The ability to process phonemes is typically called *phonemic awareness*, whereas *phonological awareness* is general term referring to the ability to manipulate several units of spoken languages, such as syllables or onsets and rimes in addition to phonemes.

(Carlo et al., 2004; Kieffer & Lesaux, 2012b; Wagner, Muse, & Tannenbaum, 2007). The derivational production task asked students to fill the blank sentence by deriving a given root word (*farm*. My uncle is a _____; 1. *farming,* 2. *farmer*, or 3. *farms*) or by decomposing a given derived word to find the root word (*farmer*. My uncle has a huge _____; 1. *farming,* 2. *farms*, or 3. *farm*).

For the compound production task, nine test items were randomly selected from McBride-Chang et al. (2005b). This task required participants to listen to the definition of a compound word and make a new compound word based on the question (Early in the morning, we can see the sun rising. This is called a *sunrise.* At night, we might also see the moon rising. What could we call this? 1. a *moonrise*, 2. a *risemoon,* or 3. a *sunmoon*). All the derivation and compound production test items were orally presented, and the participants were asked to choose appropriate number (i.e., 1, 2, or 3) on a provided answer sheet.

English OA (EOA)

For testing EOA, eight pairs of test items were randomly selected from the non-word choice tasks suggested by Wang, Perfetti, and Liu (2005). The non-word choice task is one of the most widely used in testing young children's English orthographic awareness (Cassar & Treiman, 1997; Siegel, Share, & Geva, 1995; Treiman, 1993). The test items were presented on the answer sheet, and the participant was asked to circle one word from each pair that looked more like a real word (e.g., *clid* – *cdil, cd* does not occur at the beginning of an English word).

English vocabulary (EVocab)

Receptive vocabulary testing items were selected from two standardized vocabulary tests, the Peabody Picture Vocabulary Test (Dunn & Dunn, 2007) and the Gates-MacGinitie Vocabulary Test (MacGinitie, MacGinitie, Maria, & Dreyer, 2000). First, the test items from the Peabody Picture Vocabulary Test were selected in correspondence with the participants' age (i.e., Set 9 for starting age 10). Twelve odd-numbered test items from the starting point were selected for the present study. The participants were then asked to listen to a word and to choose an appropriate picture on the answer sheet to represent the word's meaning. Second, eight test items in total were selected from the Gates-MacGinitie Vocabulary Test, Level 4. The participants were asked to read a phrase or a sentence and to find an appropriate vocabulary meaning from the given options (e.g., the good physician. 1. *medicine*, 2. *exercise, or* 3. *doctor*).

English reading comprehension (ERC)

Five paragraphs were selected from the Gates-MacGinitie Reading Comprehension Test, Level 4 (MacGinitie et al., 2000). Participants were presented with three narrative texts and two expository texts, and then they were asked to read a paragraph and answer multiple-choice questions about the text. The total number of questions was 10.

Korean MA (KMA)

Similar to the English task, both derivational and compound production tasks were used for evaluating the participants' KMA, which were created by the researcher.[2] The Korean derivational production task consisted of both a derivational task (사과[an apple]. 아직 덜 익은 사과를_____ 라고 한다. [A codling is an _____]; 1. 사 과[a new-apple], 2. 날사과[an uncooked-apple], or 3. 풋사과[an unripe-apple]) and a decomposition task (헛고생[a futile-training]. 젊어서_____ 은 사서도 한다. [Early _____ in youth is a quiet rest in old age]; 1. 고난[pain], 2. 고민[worry], or 3. 고생[training]). The Korean compound production task required students to choose proper compound words after listening to the descriptions (e.g., 우리는 강의 가장자리 부근을 '강가'라고 말해요. 그럼, 바다의 가장자리 부근은 무엇이라고 말할까요? [We say the area of land by the bank of a river, a 'river-side'. What do you call the area of land by the bank of an ocean?]; 1. 가바다[a side-ocean], 2. 바닷가[an ocean-side], or 3. 강바다[a river-ocean]). All test items were orally presented, and the participants were asked to choose the appropriate number (i.e., 1, 2, or 3) on the answer sheet. Each of the Korean derivation and compound tasks consisted of 12 test items, and the total number of test items was 24.

Procedure

Equivalent procedures were adapted for measure implementation for both the Korean ESL and Korean EFL learners. First, all measures were administered as audio-based tests and answer sheets were provided. The students listened to the descriptions of each task through a CD-ROM and were asked to circle the appropriate number on the answer sheet. Second, the sequence of tests administered was from EPA, to EMA, to EOA, to EVocab, to KMA, and to ERC. Third, the participants were allowed to ask questions whenever they needed clarification with regard to the direction of the material.

Due to testing time and place restrictions, however, there were slightly different testing conditions between the groups. For the ESL participants, a medium to large group of children (i.e., five to ten participants at a time) were tested in a Korean language school classroom after school. Approximately 1 h was required for the test administration, with 5-min breaks between the KMA and ERC test. For the EFL participants, a large number of students (i.e., approximately 20 or 25) were assembled in a classroom during or after school. The test materials were administered for 50 min without break.

Preliminary analysis

The internal consistency reliability (Cronbach's Alpha, α) of all the measured variables were initially analyzed based on the if-item-deleted statistics. According

[2] The researcher-developed KMA was initially examined by one of the KLS school teachers to make sure the test items were appropriate for the fifth- and sixth-grade Korean ESL students. Eight students in the school were pilot tested, and no floor or ceiling effects were found.

to Cortina (1993), if a reliability coefficient for the if-item-deleted is higher than the Cronbach's alpha for scores on the full scale, the item is harmful to the reliability of the measure. Therefore, the harmful items in each measure were deleted, and the reliability based on the if-item-deleted analysis was used for final analysis. Accordingly, there were 16 EPA, 18 EMA, 7 EOA, 20 EVocab, 10 ERC, and 17 KMA items, and all the internal consistency reliabilities of the measures were high ($\alpha = .71$, .89, .84, .90, .84, and .84, respectively).

Multivariate normality on the two endogenous variables (i.e., vocabulary and reading comprehension) was tested. Statistically, all the distributions were significantly different from the multivariate normality assumption (all $ps < .05$). The Q–Q plots for the two variables were not arranged in a linear line; thus, instead of using a normal theory method (i.e., maximum likelihood estimation), the present study used a corrected normal theory method for continuous yet non-normal outcomes –the maximum likelihood robust estimation –which is vital to detect non-normality problems (Kline, 2011).

Results

Descriptive statistics

The descriptive statistics (Max, *M*, and *SD*) are summarized in Table 1. The Korean ESL participants showed greater scores on all the English measures than the Korean EFL participants; however, the Korean EFL students had better scores on Korean MA than their Korean ESL counterparts. This group difference was tested by the descriptive discriminant analysis, which is useful to identify the group difference is statistically significant as well as what variables best capture the group difference. In addition, the descriptive discriminant analysis is vital to minimizing Type I error by pinpointing where the group difference comes from with one statistical procedure, while MANOVA test is not (Sherry, 2006). The descriptive discriminant

Table 1 Descriptive statistics of all measured variables

Variable	Max	ESL ($N = 50$)		EFL ($N = 257$)		All ($N = 307$)	
		M	*SD*	*M*	*SD*	*M*	*SD*
EPA	16	8.88	3.19	5.32	2.66	5.90	3.05
EMA	18	17.10	1.49	7.54	4.12	9.10	5.20
EOA	7	6.40	0.95	5.42	2.11	5.58	2.00
EVocab	20	18.50	2.35	6.62	3.89	8.56	5.73
ERC	10	8.76	1.67	2.59	2.15	3.59	3.09
KMA	17	11.42	3.429	14.48	3.15	13.98	3.39

Max maximum score of the measured variable; *EPA* English phonological awareness; *EMA* English morphological awareness; *EOA* English orthographic awareness; *EVocab* English vocabulary; *ERC* English reading comprehension; *KMA* Korean morphological awareness

Table 2 Summary of descriptive discriminant analysis results

Variable	Function_Group				Λ	*F*	*df*	*p*
	β	r_s	r_s^2 (%)	R_c^2 (%)				
EPA	− 0.32	.31	9.61	70.01	.30	364.97	6	< .01
EMA	0.22	.61	37.21					
EOA	− 0.18	.12	1.44					
EVocab	0.65	.78	60.84					
ERC	0.40	.72	51.84					
KMA	− 0.47	− .23	5.29					

Function_Group canonical function for discriminating the Korean ESL and the Korean EFL groups; β standardized canonical discriminant function coefficient; r_s structure coefficient; r_s^2 squared structure coefficient; R_c^2 squared canonical correlation coefficient; *Λ* Wilk's lamda; *F* Chi square difference statistic; R_c^2 is analogous to variance-explained effect size (η^2) in MANOVA testing

analysis result showed statistically significant difference between the ESL and EFL groups (F [6, 300] = 364.97, $p < .01$, Wilks' $\Lambda = .30$, $R_c^2 = 70.01\%$). The group difference was primarily explained by EVocab ($\beta = 0.65$, $r_s^2 = 60.84\%$) and ERC variables ($\beta = 0.40$, $r_s^2 = 51.84\%$), not by EPA, EMA, EOA, and KMA variables (Table 2).

Two correlation matrices for all measured variables are presented: below the diagonal represents the ESL group matrix; and above the diagonal, the EFL group matrix (Table 3). There were similar inter-correlations among variables between the two groups. First, three types of English metalinguistic awareness (EPA, EMA, and EOA) were positively correlated in both groups. For the ESL group, the correlation ranged from .36 to .54 ($ps < .05$), and for the EFL group, the range was from .43 to .53 ($ps < .01$). Second, both the ESL and EFL groups had high correlations between MA and vocabulary. The correlation between EMA and EVocab was .62 for the ESL group and .67 for the EFL group ($ps < .01$). The cross-linguistic correlations between KMA and EVocab were also statistically significant in both groups ($r = .45$ and .29, $ps < .01$). Third, all measured variables were positively correlated with reading comprehension in the ESL group, as well as in the EFL group. Both groups showed that the correlation between EVocab and ERC was highest ($r = .74$ and .53, $ps < .01$), and between EMA and ERC was second highest ($r = .68$ and .48, $ps < .01$).

However, the cross-linguistic correlation between KMA and English reading comprehension in the ESL group was quite distinct from that in the EFL group. The correlation between KMA and ERC in the ESL group was statistically significant ($r = .47$, $p < .01$), while it was not in the EFL group ($r = .10$, $p > .05$).

The multiple-group within-linguistic model

Sequential pair-wise comparisons between the freely estimated models and the fixed path of interest models showed the direct and indirect MA effects on reading comprehension for both the ESL and EFL groups (Table 4 and Fig. 1). The direct

Table 3 Correlations among all measured variables

Variable	1	2	3	4	5	6
1. EPA	1	.53**	.43**	.49**	.37**	.33**
2. EMA	.36*	1	.48**	.67**	.48**	.30**
3. EOA	.40**	.54**	1	.41**	.29**	.42**
4. EVocab	.46**	.62**	.53**	1	.53**	.29**
5. ERC	.49**	.68**	.64**	.74**	1	.10
6. KMA	.25	.26	.22	.45**	.47**	1

The ESL group is below and the EFL group is above the diagonal

EPA English phonological awareness; *EMA* English morphological awareness; *EOA* English orthographic awareness; *EVocab* English vocabulary; *ERC* English reading comprehension; *KMA* Korean morphological awareness

* $p < .05$, ** $p < .01$

effect of EMA on ERC was statistically significant in both groups ($\beta = 0.27$ for the ESL group and $\beta = 0.19$ for the EFL group, $ps < .01$). However, the direct path did not show any statistically significant between-group differences ($\Delta\chi^2 = 2.56$, $df = 1$, $p > .05$). The indirect path from EMA to ERC via EVocab was slightly larger in the EFL group ($\beta = 0.19$, $p < .01$) than in the ESL group ($\beta = 0.17$, $p < .01$). The Chi square difference test showed that the between-group difference was statistically significant ($\Delta\chi^2 = 26.25$, $df = 3$, $p < .01$) (Table 4).

In addition, the variance of ERC in the EFL group remained largely unexplained ($R^2_{\text{ERC in EFL}} = 31\%$), while the majority of ERC variance in the ESL group was well-explained by the measured variables ($R^2_{\text{ERC in ESL}} = 68\%$) (Fig. 1).

The multiple-group cross-linguistic model

Cross-linguistic transfer of MA to reading comprehension was not equivalent across learners in different language learning contexts (ESL and EFL) even though they learned to read the same two languages (i.e., Korean and English). In particular, the direct path from KMA to ERC was positive and statistically significant in the ESL group ($\beta = 0.18$, $p < .05$), but the path in the EFL group was negative and was not statistically significant ($\beta = -0.11$, $p < .05$). This between-group difference was statistically significant ($\Delta\chi^2 = 8.19$, $df = 1$, $p < .05$) (Table 5). Furthermore, compared to the within-linguistic model, the cross-linguistic model explained more variance for the Korean ESL group (from 68 to 71%) (Fig. 2). These increased variances represent that MA in one language played a facilitative role in developing vocabulary and reading comprehension in the other.

Table 4 Summary of parameters in the multiple-group within-linguistic model

Parameter	ESL		EFL		Comparison to fixed model	
	Standardized	SE	Standardized	SE	$\Delta\chi^2$	*df*
Path coefficient (β)						
EVocab on EPA	0.22	0.11	0.17**	0.05	0.61	1
EVocab on EMA	0.43**	0.12	0.54**	0.05	0.67	1
EVocab on EOA	0.22	0.12	0.07	0.05	1.42	1
ERC on EPA						
Direct	0.11	0.09	0.09	0.06	0.05	1
Indirect	0.08	0.05	0.06*	0.02	1.50	3
Total	0.19*	0.09	0.15*	0.07		
ERC on EMA						
Direct	0.27*	0.11	0.19*	0.08	2.56	1
Indirect	0.17**	0.07	0.19**	0.04	26.25**	3
Total	0.44**	0.10	0.38**	0.06		
ERC on EOA						
Direct	0.25*	0.10	0.02	0.06	4.68*	1
Indirect	0.08	0.05	0.03	0.02	2.42	3
Total	0.33**	0.11	0.05	0.06		
ERC on EVocab	0.39**	0.11	0.35**	0.07	0.89	1
Correlation (*r*)						
EPA with EMA	0.54**	0.12	0.48**	0.05		
EMA with EOA	0.40**	0.12	0.43**	0.05		
EOA with EPA	0.54**	0.10	0.48**	0.05		
R-square (R^2)						
EVocab	0.48**	0.10	0.48**	0.05		
ERC	0.68**	0.07	0.31**	0.05		

ESL the ESL group; *EFL* the EFL group; $\Delta\chi^2$ Chi square difference between freely estimated model and fixed-path of interest model; *df* degrees of freedom; *EPA* English phonological awareness; *EMA* English morphological awareness; *EOA* English orthographic awareness; *EVocab* English vocabulary; *ERC* English reading comprehension

* $p < .05$, ** $p < .01$

Discussion

Results of the present study showed both similarities and differences between the Korean ESL and Korean EFL students regarding the role of MA in reading comprehension. With respect to this study's first research question, the direct MA effect on reading comprehension for the ESL group was similar to the EFL group. The direct contribution of MA to reading comprehension was positive not only in the ESL group, but also in the EFL group. Even though the ESL group showed a greater direct effect on reading comprehension than the EFL group, the difference was not statistically significant. However, regarding the present study's second

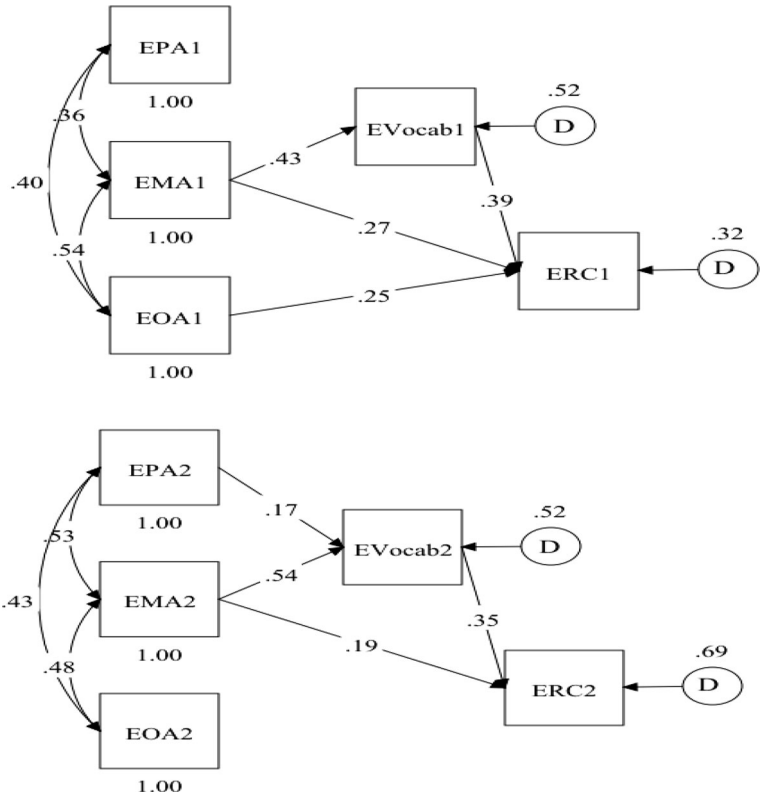

Fig. 1 The multiple-group within-linguistic model. The subscription 1 represents the ESL group; 2 indicates the EFL group. Single-headed arrows represent statistically significant path coefficients (β) and double-headed arrows indicate statistically significant correlations (*r*) between exogenous variables (all *p*s $< .05$). The disturbance (D) is an unexplained variance in the endogenous variables which can be calculated by $1 - R^2$. *EPA* English phonological awareness; *EOA* English orthographic awareness; *EMA* English morphological awareness; *EVocab* English vocabulary; and *ERC* English reading comprehension

research question, the two groups showed distinct differences in the indirect effect of MA on reading comprehension. The indirect effect of EMA on ERC was larger for the EFL group than the ESL group, and the group-difference was statistically significant. In short, both the Korean ESL and Korean EFL learners primarily utilized their knowledge of processing morphological structure to extract meaning from texts (reading comprehension). The specific pattern of using MA in deciphering text meaning was not identical between the two groups: the ESL group students use both MA and vocabulary separately, whereas the EFL group students rely more on their vocabulary knowledge which was activated by their morphological processing skill. This strategic language processing skill affected their success at reading comprehension.

According to the multiple-group comparisons, the present study's third research question answered that cross-linguistic transfer patterns can be different according to the learners' language learning context. The positive transfer from L1 (Korean)

Table 5 Summary of parameters in the multiple-group cross-linguistic model

Parameter	The multiple-group KMA → ERC model					
	ESL		EFL		Comparison to fixed model	
	Standardized	SE	Standardized	SE	$\Delta\chi^2$	*df*
Path coefficient (β)						
EVocab on KMA	0.26*	0.10	0.05	0.05	1.86	1
ERC on KMA						
Direct	0.18*	0.09	−0.11*	0.06	8.19*	1
Indirect	0.08	0.04	0.02	0.02	4.24	3
Total	0.26**	0.09	−0.09	0.06		
Correlation (*r*)						
KMA with EPA	0.25	0.13	0.33**	0.06		
KMA with EMA	0.26*	0.13	0.30**	0.06		
KMA with EOA	0.22	0.14	0.42**	0.05		
R-square (R^2)						
EVocab	0.54**	0.10	0.48**	0.05		
ERC	0.71**	0.07	0.32**	0.05		

ESL the ESL group; *EFL* the EFL group; $\Delta\chi$ Chi square difference between freely estimated model and fixed-path of interest model; *df* degrees of freedom; *EPA* English phonological awareness; *EMA* English morphological awareness; *EOA* English orthographic awareness; *EVocab* English vocabulary; *ERC* English reading comprehension; *KMA* Korean morphological awareness

* $p < .05$, ** $p < .01$

MA to L2 (English) reading comprehension was only found in the ESL group, not in the EFL group. In particular, the direct effect from L1 MA to L2 reading comprehension showed statistically significant between-group differences. Additionally, the present study result suggests the cross-linguistic MA contribution to reading comprehension becomes more salient at the upper elementary grades. Wang et al. (2009) found that among Korean ESL learners L1 MA was only transferred to facilitate English word reading, not passage level reading. However, participants in Wang et al. (2009) were third- and fourth-grade Korean ESL learners, whereas our participants were fifth- and sixth-graders.

The results of the present study provided empirical evidence that positive cross-linguistic MA transfer was only found in the ESL group, not in the EFL group. The Korean EFL participants have had very limited L2 literacy input once the weekly instruction time and total length of study have been considered. Their L2 vocabulary and reading comprehension scores were quite low compared to their Korean ESL counterparts. Recapitulating the threshold hypothesis (Cummins, 1981, 2000), since the Korean EFL learners' L2 proficiency might not have reached the appropriate level (i.e., threshold), they may not be able to incorporate their L1 MA as a useful resource in learning to read L2. Thus, this study confirmed the research hypothesis that cross-linguistic transfer patterns may vary according to the learners' language learning contexts, even though their L1 and L2 share similar linguistic structures.

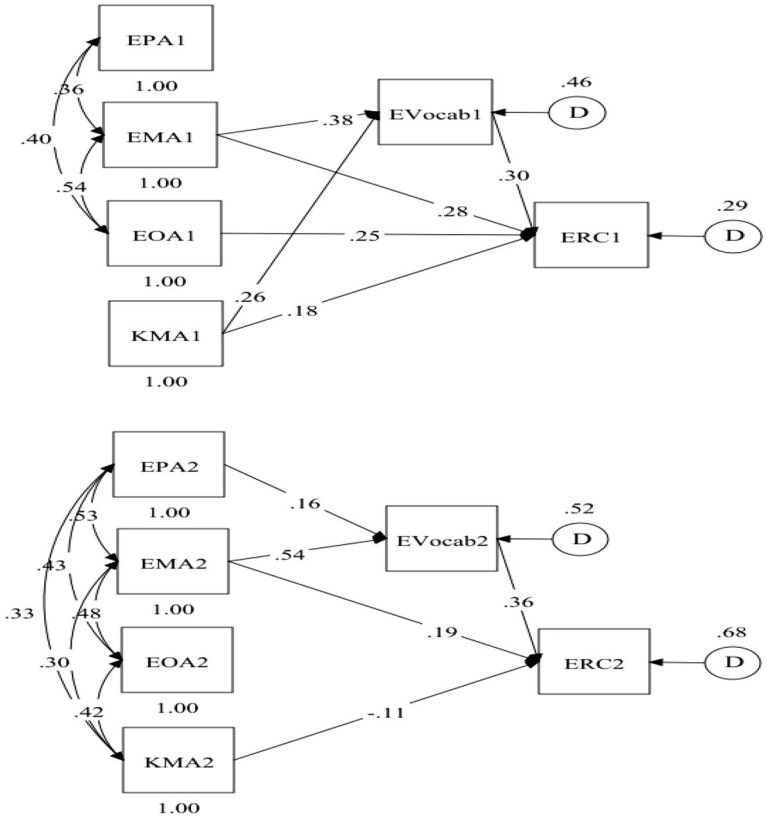

Fig. 2 The multiple-group cross-linguistic model. The subscription 1 represents the ESL group; 2 indicates the EFL group. Single-headed arrows represent statistically significant path coefficients (β) and double-headed arrows indicate statistically significant correlations (*r*) between exogenous variables (all *p*s $< .05$). The disturbance (D) is an unexplained variance in the endogenous variables which can be calculated by $1 - R^2$. *EPA* English phonological awareness; *EOA* English orthographic awareness; *EMA* English morphological awareness; *EVocab* English vocabulary; *ERC* English reading comprehension; and *KMA* Korean morphological awareness

Educational implications

Morphological units (i.e., free morphemes and affixes) and their formation rules for making complex words have been regarded as difficult to master, hence their traditional exclusion from elementary literacy instruction (Rasinski, Padak, Newton, & Newton, 2011). However, consistent research findings (Goodwin et al., 2013; Kieffer & Box, 2013; Kieffer & Lesaux, 2008; Zhang & Koda, 2013) and results from the present study have provided evidence that MA is a unique predictor of upper elementary students' English vocabulary and reading comprehension, even though English was being taught as a second or foreign language. Thus, the positive role of teaching morphological units of words to enhance literacy development for upper-elementary English language learners is worthy of note. Instructional ideas

and programs on MA teaching for students should also be developed. Teachers of upper-elementary ESL and EFL learners should be aware that the students' L1 MA benefits their L2 reading development. For those students who learn to read two languages at the same time, extensive exposure to oral and print and instructional supports in both languages should be maintained. Importantly, the oral ability to process similar morphological structures across languages can be positively transferred to facilitate literacy development in both languages. Therefore, educators of ESL and EFL learners should encourage the learners to work MA-processing skills in one language to be positively transferred to their learning to read in another language.

Limitations and future directions

The small sample size is one limitation of the present study. For the multiple-group within-linguistic model analysis utilized, the Korean ESL ($N = 50$) and the Korean EFL ($N = 257$) groups met the three requirements of determining sample size and statistical power in the Monte Carlo simulation (Brown, 2006): first, bias of the parameters and their standard errors in the model should be less than 10%; second, 95% coverage should be between .91 and .98; and third, power of the parameters of interest should be .80 or above. However, for the multiple-group cross-linguistic model analysis in the present study, an increased sample size for the ESL group would have been advantageous to obtain a statistical power of .80 or above. Since the population of Korean ESL learners in the U.S. is small, there were practical difficulties to increasing the sample size. Despite this limitation, the present study is a meaningful starting point to investigate the effects of language-learning contexts in learning to read English among less populated, L1 background samples.

In addition, the quality of instruction should be considered in future work. In the present study, the environmental aspects of learning to read languages generally categorized the instructional differences between ESL and EFL contexts. Even though the two language learning contexts are distinct from each other with regard to societal and instrumental language use, language of instruction, and amount of literacy input in each language, it should be noted that possible variations of instructional quality may exist between the two groups. For example, as far as English instruction is concerned, the Korean ESL learners learn to read English from native English teachers with many English-only interactions among their teachers and peers. They read texts of various genres (e.g., narrative and expository), and reading books at school is often accompanied by composing reading logs or journals. The English reading instruction for the Korean EFL learners, however, is limited to reading short sentences or phrases that are mainly used for simple communication (e.g., invitations, daily journals, and time tables). If these aspects were to be included in a future investigation, the reason for the within- and cross-language differences between the two groups may be better explained.

Conclusion

The present study provided empirical evidence to support the variation of MA's role in reading comprehension across different language learning contexts (ESL and EFL). The multiple-group within-linguistic path model analysis showed that the positive role of MA in reading comprehension in English was not statistically different across the Korean ESL and Korean EFL groups; however, the differences in the pattern of the cross-linguistic transfer proved statistically significant between groups. The multiple-group cross-linguistic path model analysis revealed that the Korean ESL learners utilized their L1 MA to facilitate their L2 reading comprehension, whereas their Korean EFL counterparts did not. The present study's findings suggest that positive cross-linguistic transfer is possible not only when the learners' L1 and L2 share a similar linguistic structure, but also when the learners have a threshold level of L2 proficiency.

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References

Berninger, V. W., Abbott, R. D., Nagy, W., & Carlisle, J. F. (2010). Growth in phonological, orthographic, and morphological awareness in grades 1 to 6. *Journal of Psycholinguistic Research, 39,* 141–163. https://doi.org/10.1007/s10936-009-9130-6.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York, NY: Guilford Press.

Carlisle, J. F. (2000). Awareness of the structure and meaning of morphologically complex words: Impact on reading. *Reading and Writing: An Interdisciplinary Journal, 12,* 169–190.

Carlo, M. S., August, D., McLaughlin, B., Snow, C., Dressler, C., Lippman, D., et al. (2004). Closing the gap: Addressing the vocabulary needs of English-language learners in bilingual and mainstream classrooms. *Reading Research Quarterly, 39,* 188–215.

Carter, R., & Nunan, D. (Eds.). (2001). *The Cambridge guide to teaching English to speakers of other languages*. Cambridge: Cambridge University Press.

Cassar, M. T., & Treiman, R. (1997). The beginning of orthographic knowledge: Children's knowledge of double letters in words. *Journal of Educational Psychology, 89,* 631–644.

Cho, J.-R., Chiu, M. M., & McBride-Chang, C. (2011). Morphological awareness, phonological awareness, and literacy development in Korean and English: A 2-year longitudinal study. *Scientific Studies of Reading, 15,* 383–408. https://doi.org/10.1080/10888438.2010.487143.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, *78*, 98–104.

Cummins, J. (1981). The role of primary language development in promoting educational success for language minority students. In California State Department of Education & S. Amrita (Eds.), *Schooling and language minority students: A theoretical framework* (pp. 3–49). Los Angeles, LA: Evaluation, Dissemination and Assessment Center California State University.

Cummins, J. (2000). *Language, power, and pedagogy: Bilingual children in the crossfire*. Clevedon: Multilingual Matters.

Deacon, S. H., & Kirby, J. R. (2004). Morphological awareness: Just "more phonological"? The roles of morphological and phonological awareness in reading development. *Applied Psycholinguistics, 25,* 223–238. https://doi.org/10.1017/S0142716404001110.

Dunn, L., & Dunn, L. (2007). *Peabody picture vocabulary test* (4th ed.). Minneapolis, MN: Pearson Assessments.

Ellis, R. (2008). *The study of second language acquisition*. New York, NY: Oxford University Press.

Farran, L. K., Bingham, G. E., & Matthews, M. W. (2012). The relationship between language and reading in bilingual English–Arabic children. *Reading and Writing: An Interdisciplinary Journal, 25,* 2153–2181. https://doi.org/10.1007/211145-011-9352-5.

Goodwin, A. P., Huggins, A. C., Carlo, M. S., August, D., & Calderon, M. (2013). Minding morphology: How morphological awareness relates to reading for English language learners. *Reading and Writing: An Interdisciplinary Journal, 26,* 1387–1415. https://doi.org/10.1007/s11145-012-9412-5.

Gottardo, A., Stanovich, K. E., & Siegel, L. S. (1996). The relationships between phonological sensitivity, syntactic processing and verbal working memory in the reading performance of third-grade children. *Journal of Experimental Child Psychology, 63,* 563–582.

Hu, C.-F. (2013). Predictors of reading in children with Chinese as a first language: A developmental and cross-linguistic perspective. *Reading and Writing: An Interdisciplinary Journal, 26,* 163–187. https://doi.org/10.1007/s11145-012-9360-0.

Jeon, E. H. (2011). Contribution of morphological awareness to second-language reading comprehension. *The Modern Language Journal, 95*(2), 217–235. https://doi.org/10.1111/j.1540-4781.2011.01179.x.

Jongejan, W., Verhoeven, L., & Siegel, L. (2007). Predictors of reading and spelling abilities in first- and second-language learners. *Journal of Educational Psychology, 99*(4), 835–851. https://doi.org/10.1037/0022-0663.99.4.835.

Kachru, B. B. (1989). Teaching word Englishes. *Indian Journal of Applied Linguistics, 15,* 85–95.

Kieffer, M. J., & Box, C. D. (2013). Derivational morphological awareness, academic vocabulary, and reading comprehension in linguistically diverse sixth graders. *Learning and Individual Differences, 24,* 168–175. https://doi.org/10.1016/j.lindif.2012.12.017.

Kieffer, M. J., & Lesaux, N. K. (2008). The role of derivational morphology in the reading comprehension of Spanish-speaking English language learners. *Reading and Writing: An Interdisciplinary Journal, 21,* 783–804. https://doi.org/10.1007/s11145-007-9092-8.

Kieffer, M. J., & Lesaux, N. K. (2012a). Direct and indirect roles of morphological awareness in the English reading comprehension of native English, Spanish, Filipino, and Vietnamese speakers. *Language Learning, 62,* 1170–1204. https://doi.org/10.1111/j.1467-9922.2012.00722.x.

Kieffer, M. J., & Lesaux, N. K. (2012b). Knowledge of words, knowledge about words: Dimensions of vocabulary in first and second language learners in sixth grade. *Reading and Writing: An Interdisciplinary Journal, 25,* 347–373.

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York, NY: The Guilford Press.

Koda, K. (2005). *Insights into second language reading: A cross-linguistic approach*. New York, NY: Cambridge University Press.

Koda, K. (2008). Impacts of prior literacy experience on second language learning to read. In K. Koda & A. Zehler (Eds.), *Learning to read across languages* (pp. 68–97). New York, NY: Routledge.

Kuo, L.-J., & Anderson, R. C. (2010). Beyond cross-language transfer: Reconceptualizing the impact of early bilingualism on phonological awareness. *Scientific Studies of Reading, 14,* 365–385. https://doi.org/10.1080/10888431003623470.

MacGinitie, W., MacGinitie, R., Maria, K., & Dreyer, L. G. (2000). *Gates-MacGinitie reading test* (4th ed.). Itasca, IL: Riverside Publishing Company.

Mahfoundhi, A., Elbeheri, G., Al-Rashidi, M., & Everatt, J. (2010). The role of morphological awareness in reading comprehension among typical and learning disabled native Arabic speakers. *Journal of Learning Disabilities, 43,* 500–514. https://doi.org/10.1177/0022219409355478.

McBride-Chang, C. (1996). Models of speech perception and phonological processing in reading. *Child Development, 67,* 1836–1856.

McBride-Chang, C., Cho, J.-R., Liu, H., Wagner, R. K., Shu, H., Zhou, A., et al. (2005a). Changing models across cultures: Associations of phonological awareness and morphological structure awareness with vocabulary and word recognition in second graders from Beijing, Hong Kong, Korea, and the United States. *Journal of Experimental Child Psychology, 92,* 140–160. https://doi.org/10.1016/j.jecp.2005.03.009.

McBride-Chang, C., Tardif, T., Cho, J.-R., Shu, H., Fletcher, P., Stokes, S. F., et al. (2008). What's in a word? Morphological awareness and vocabulary knowledge in three languages. *Applied Psycholinguistics, 29,* 437–462. https://doi.org/10.1017/S014271640909020X.

McBride-Chang, C., Wagner, R. K., Muse, A., Chow, B. W., & Shu, H. (2005b). The role of morphological awareness in children's vocabulary acquisition in English. *Applied Psycholinguistics, 26,* 415–435. https://doi.org/10.1017/S014271640505023X.

Nagy, W. (2007). Metalinguistic awareness and the vocabulary-comprehension connection. In R. K. Wagner, A. E. Muse, & K. R. Tannenbaum (Eds.), *Vocabulary acquisition: Implications for reading comprehension* (pp. 52–77). New York, NY: The Guilford Press.

Nagy, W., Berninger, V. W., & Abbott, R. D. (2006). Contributions of morphology beyond phonology to literacy outcomes of upper elementary and middle-school students. *Journal of Educational Psychology, 98,* 134–147. https://doi.org/10.1037/0022-0663.98.1.134.

Pasquarella, A., Chen, X., Lam, K., Luo, Y. C., & Ramirez, G. (2011). Cross-language transfer of morphological awareness in Chinese–English bilinguals. *Journal of Research in Reading, 34,* 23–42. https://doi.org/10.1111/j.1467-9817.2010.01484.x.

Ramirez, G., Chen, X., Geva, E., & Kiefer, H. (2010). Morphological awareness in Spanish-speaking English language learners: Within and cross-language effects on word reading. *Reading and Writing: An Interdisciplinary Journal, 23,* 337–358. https://doi.org/10.1007/s11145-009-9203-9.

Ramirez, G., Chen, X., & Pasquarella, A. (2013). Cross-linguistic transfer of morphological awareness in Spanish-speaking English language learners. *Topics in Language Disorders, 33*(1), 73–92. https://doi.org/10.1097/TLD.0b013e318280f55a.

Rasinski, T., Padak, N., Newton, J., & Neton, E. (2011). The Latin-Greek connection: Building vocabulary through morphological study. *The Reading Teacher, 65,* 133–141. https://doi.org/10.1002/TRTR.01015.

Sherry, A. (2006). Discriminant analysis in counseling psychology research. *The Counseling Psychologist, 34*(5), 661–683. https://doi.org/10.1177/0011000006287103.

Siegel, L. S., Share, D., & Geva, E. (1995). Evidence for superior orthographic skills in dyslexics. *Psychological Science, 6,* 250–254.

Treiman, R. (1993). *Beginning to spell*. New York, NY: Oxford University Press.

Wagner, A. E., Muse, A. E., & Tannenbaum, K. R. (2007). Promising avenues for better understanding implications of vocabulary development for reading comprehension. In R. K. Wagner, A. E. Muse, & K. R. Tannenbaum (Eds.), *Vocabulary acquisition: Implications for reading comprehension* (pp. 276–291). New York, NY: Guilford Press.

Wagner, R. K., Torgesen, J. K., & Rashotte, C. A. (1994). Development of reading-related phonological processing abilities: New evidence of bidirectional causality from a latent variable longitudinal study. *Developmental Psychology, 30,* 73–87.

Wang, M., Cheng, C., & Chen, S.-W. (2006). Contribution of morphological awareness to Chinese–English biliteracy acquisition. *Journal of Educational Psychology, 98,* 542–553. https://doi.org/10.1037/0022-0663.98.3.542.

Wang, M., Ko, I. Y., & Choi, J. (2009). The importance of morphological awareness in Korean-English biliteracy acquisition. *Contemporary Educational Psychology, 34,* 132–142. https://doi.org/10.1016/j.cedpsych.2008.12.002.

Wang, M., Perfetti, C. A., & Liu, Y. (2005). Chinese–English biliteracy acquisition: cross-language and writing system transfer. *Cognition, 97,* 67–88. https://doi.org/10.1016/j.cognition.2004.10.001.

Zhang, D., & Koda, K. (2012). Contribution of morphological awareness and lexical inferencing ability to L2 vocabulary knowledge and reading comprehension among advanced EFL learners: Testing direct and indirect effects. *Reading and Writing: An Interdisciplinary Journal, 25,* 1195–1216. https://doi.org/10.1007/s11145-011-9313-z.

Zhang, D., & Koda, K. (2013). Morphological awareness and reading comprehension in a foreign language: A study of young Chinese EFL learners. *System, 41,* 901–913. https://doi.org/10.1016/j.system.2013.09.009.