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The Multidimensionality of Morphological Awareness and Its Cross-Linguistic Relations with Vocabulary, Word Reading, and Reading Comprehension between Korean and English for Korean-Speaking Grade 7 Students Learning English as a Foreign Language

Author

Lee, Joong won

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The Multidimensionality of Morphological Awareness and Its Cross-Linguistic Relations with Vocabulary, Word Reading, and Reading Comprehension between Korean and English for Korean-Speaking Grade 7 Students Learning English as a Foreign Language

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Education

by

Joong won Lee

Dissertation Committee:
Professor Young-Suk Kim (Chair)
Professor Penelope Collins
Professor Glenn Levine
Professor Elizabeth Peña

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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VITA

Joong won Lee

2016	B.A. in English, Hankuk University of Foreign Studies & University of Delaware
2016-17	Research Assistant in Education, Harvard Graduate School of Education
2017	Ed.M. in Language & Literacy, Harvard Graduate School of Education
2018-20	Teaching Assistant in Education, University of California, Irvine
2020-22	Graduate Student Researcher in Education, University of California, Irvine
2021-22	Pedagogical Fellow for School of Education, University of California, Irvine
2022-23	Teaching Assistant in Education, University of California, Irvine
2023	Ph.D. in Education, University of California, Irvine

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ABSTRACT OF THE DISSERTATION

The Multidimensionality of Morphological Awareness and Its Cross-Linguistic Relations with Vocabulary, Word Reading, and Reading Comprehension between Korean and English for Korean-Speaking Grade 7 Students Learning English as a Foreign Language

by

Joong won Lee

Doctor of Philosophy in Education

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Professor Young-Suk Kim, Chair

Reading is a complex skill composed of a wide array of language and literacy subskills. In this dissertation, I explored how morphological awareness is related with vocabulary, word reading, and reading comprehension in Korean and English in the context of Korean-speaking middle school students in South Korea who were learning English as a Foreign Language (EFL). In Study 1, I examined how morphological awareness, vocabulary, word reading, and reading comprehension were directly and indirectly related for the students' Korean, their L1. Then, in Study 2, I looked at their aforementioned skills in both Korean (L1) and English (L2). I first tested the multidimensionality of morphological awareness in Korean and English, using three types of morphological awareness—inflectional, derivational, and compound morphological awareness. Then, I explored how their morphological awareness was related with vocabulary, word reading, and reading comprehension across Korean and English. Lastly, for Study 3, I delved into morphological analysis—one of the mechanisms through which morphological awareness is associated with vocabulary, word reading, and reading comprehension—and examined whether it played a role in explaining the relation of morphological awareness with

vocabulary, word reading, and reading comprehension for the Korean students' English.

One hundred and twenty-one Grade 7 students from two middle schools in a metropolitan city in South Korea participated in this study. The students were measured in morphological awareness, vocabulary, word reading, and reading comprehension in Korean and English, and morphological analysis only in English. In Study 1, I found morphological awareness predicted reading comprehension both directly and indirectly via word reading in Korean. In Study 2, morphological awareness was found to be multidimensional by language (Korean and English), and morphological awareness in Korean predicted reading comprehension in English via reading comprehension in Korean and morphological awareness in English. Study 3 revealed that morphological analysis partially mediated the relation of morphological awareness with reading comprehension over and above vocabulary and word reading in English.

CHAPTER 1: Introduction

Reading—the process of making sense of written texts (Ziegler & Goswami, 2005)—is one of the most fundamental activities of human life, and the ways we develop the ability to do so continue to occupy scholars in education and in other related fields. Moreover, the process becomes even more complex when reading in a new language. As a result, scholars have delved into various aspects of reading development and have proposed theoretical models to explain the skills and knowledge that contribute to reading, such as the Triangle Model for word reading (Adams, 1990), Psycholinguistic Grain Size theory (Ziegler & Goswami, 2005), the Reading Systems Framework (Perfetti & Stafura, 2014), and the Direct and Indirect Effects model of Reading (DIER, see Y.-S. Kim, 2020a, 2020b, 2023).

Morphological awareness—one's awareness of the smallest meaning units of words (Bowers et al., 2010; Carlisle, 2000; Goodwin & Ahn, 2010, 2013; Kuo & Anderson, 2006; Nagy et al., 2006)—is one of the critical skills associated with diverse language and reading skills (Carlisle et al., 2010; Goodwin & Ahn, 2010, 2013; McBride-Chang et al., 2008; Zhang & Koda, 2014). According to syntheses of existing research on the relation of morphological awareness to language and literacy skills (Bowers et al., 2010; Goodwin & Ahn, 2010, 2013; Lee et al., 2022; Reed, 2008; Ruan et al., 2018; Tighe & Schatschneider, 2016), morphological awareness is positively related to phonological awareness, orthographic awareness, vocabulary, word reading, text reading fluency, and reading comprehension. To illustrate, having advanced knowledge of prefixes, suffixes, and root words that build multimorphemic words (e.g., "un-" changes the meaning of the word to which it attaches to the opposite, "-tion" makes the word with which it combines to a noun, "basketball" is composed of "ball" and "basket") can help access the meaning of the words even with the first encounter (Goodwin et al., 2012; Kuo & Anderson,

2006). This, in turn, facilitates reading comprehension because multimorphemic words that would otherwise be incomprehensible without the knowledge of the abovementioned morphemes will make sense with the knowledge of them, leading to enhanced understanding of the text that contains these words.

Throughout the three studies in my dissertation, DIER (Y.-S. Kim, 2020a, 2020b, 2023) is used as the primary theoretical model because it is a comprehensive model that shows interrelations among a wide array of skills that contribute to reading comprehension. To be more specific, DIER specifies how morphological awareness, the focus skill of my dissertation studies, is directly and indirectly associated with other language and reading skills such as vocabulary, word reading, and reading comprehension. Direct relations indicate the relations between two variables involving no mediators and indirect relations indicate the relations between two variables are through at least one mediator.

In addition to understanding how one's reading develops in a single language, proficiency in more than one language is considered indispensable for one's academic and career success in the modern globalized times (Collins & Ho, 2020; della Chiesa, 2012; Koda, 2005). Hence, development in *biliteracy*—ability to read in multiple languages (Collins & Ho, 2020)—has drawn scholars' attention. Because of the apparent challenges of learning to read in more than one language, the studies on this topic from many different contexts are warranted. Among various theories and findings regarding biliteracy development, an important aspect of biliteracy development is cross-linguistic association (e.g., Cummins, 1979, 1991, 2005; Durgunoğlu, 2002; Koda, 2005, 2007; Kuo & Anderson, 2007; Proctor et al., 2010; Sierens et al., 2020). According to the Linguistic Interdependence hypothesis (Cummins, 1979, 1991, 2005), one's L1 development contributes positively to their L2 development due to the common underlying

proficiency skills that underly L1 and L2 reading skills (Cummins, 1979, 1991, 2005). Examples of the common underlying proficiency skills include metalinguistic awareness (e.g., phonological awareness, orthographic awareness, and semantic awareness; see Adams, 1990; Y.-S. Kim, 2020b)—the ability to identify and manipulate diverse linguistic forms (Durgunoğlu, 2002; Klein, 1986; Koda, 2005, 2007; Kuo & Anderson, 2007; Y.-S. Kim & Piper, 2019; Sierens et al., 2020). In other words, the proficiency of the students' L2 is partly contributed from their foundational skills in L1, as they rely on their linguistic knowledge of L1. This theory indicates the importance of exploring the development of language and reading skills in L1 as well as L2 in understanding the L2 development.

In the dissertation, I investigated the cross-linguistic associations of Korean and English. This is meaningful because these languages share many similarities in morphological traits and developmental trajectories but also have important differences (Kuo & Anderson, 2006; Sohn, 1999). To note, there are three different types of morphemes: inflectional morphemes, derivational morphemes, and compound morphemes. Inflectional morphemes refer to suffixes that do not alter the meaning of their root word nor change their part of speech and only have grammatical effects on a root word (e.g., "-ed" in the word "showed"). Derivational morphemes are affixes that change the part of speech or the meaning of the root word (e.g., "dis-" and "-ment" in the word "disagreement"). Compound morphemes form new words by combining two or more free morphemes (e.g., ballpark = ball + park; see Kuo & Anderson, 2006; McBride-Chang et al., 2008; Reed, 2008). Unlike Spanish that is rich in derivational but not in compound morphemes and Chinese that is rich in compound but not in derivational morphemes (Lam & Sheng, 2016), Korean and English have a wide variety of both morphemes. Both Korean and English have inflectional, derivational, and compound morphemes; and awareness of inflectional

and compound morphemes develop and reach ceiling early whereas that of derivational morphemes continue to develop into adulthood. However, Korean and English also have significant differences, especially concerning orthographic depth: Korean is orthographically shallower compared to English as letter-sound correspondence is relatively consistent (Y.-S. Kim, 2010). Findings are expected to be informative for our understanding of language-general and language-specific processing of reading. Regarding a language-general aspect, these results will expand our knowledge by comparing cross-linguistic findings between Korean and English with other languages that share either more similarities or greater differences. Such comparisons may offer valuable insights into the relation between linguistic distances and cross-linguistic associations of language and reading skills for scholars in the field. For a language-specific aspect, this research can shed light on unique aspects that are due to differences in linguistic features and/or orthographic depth.

Present Studies

Whereas numerous review and empirical studies illustrate the positive relations of morphological awareness to diverse language and literacy skills such as vocabulary, word reading, and reading comprehension within and across languages (e.g., Bae & Joshi, 2017; Bowers et al., 2010; Carlisle, 2000; Casalis & Colé, 2009; Goodwin & Ahn, 2013; Kuo & Anderson, 2006; Lee et al., 2022; Kieffer & Lesaux, 2008; McBride-Chang et al., 2008; Nagy et al., 2003, 2006; Reed, 2008; Ruan et al., 2018; Tighe & Schatschneider, 2016; Zhang & Koda, 2014), these findings have seldom been examined in English as a Foreign Language (EFL) context, particularly with Korean middle school students who are beginner EFL learners. Furthermore, the majority of the studies on this topic assessed only a portion of morphological awareness such as derivational morphological awareness (e.g., Carlisle, 2000; Carlisle &

Nomanbhoy, 1993) or compound morphological awareness (e.g., McBride-Chang et al., 2008), and have rarely explored all three dimensions of morphological awareness—inflectional, derivational, and compound morphological awareness—collectively. Last but not least, the mechanism through which morphological awareness contributes to reading skills (see the Morphological Pathways Framework; Levesque et al., 2021) has not been empirically explored sufficiently, and none for students learning to read in L2. This dissertation aims to fill in these gaps with the following three studies that will be conducted in Korean EFL middle school context.

Whereas there has been some research conducted in Korean-speaking student context (e.g., Bae & Joshi, 2017; Y.-S. Kim, 2010, 2011), only a few studies have explored the direct and indirect relations of the aforementioned skills collectively. To fill in this gap, Study 1 aimed to examine the direct and indirect relations of morphological awareness, vocabulary, word reading, and reading comprehension in Korean for Korean-speaking Grade 7 students. For morphological awareness, three different types of morphological awareness (inflectional, derivational, compound morphological awareness) were measured, which very few studies have included together. Study 2 explored the relations between Korean (the participants' L1) and English (the participants' L2). First, I examined dimensionality of morphological awareness by type (inflectional, derivational, and compound morphological awareness) and by language (Korean and English). Then, applying the dimensionality of morphological awareness I have found here, I explored the cross-linguistic associations of morphological awareness, vocabulary, word reading, and reading comprehension between their Korean and English. To be more specific, I tested whether each skill in Korean (L1) predicted the corresponding skill in English (L2), and looked at their direct and indirect relations simultaneously. Study 3 explored the extent to which the EFL

Grade 7 students' morphological analysis skill of unfamiliar English multimorphemic words plays a role in explaining the relation of morphological awareness to vocabulary, word reading, and reading comprehension in English.

Organization of the Dissertation

Following this introductory chapter, my dissertation is composed of the following chapters. Chapters 2, 3, and 4 provide theoretical frameworks with literature review, describe methodology, and then report and discuss findings of Studies 1, 2, and 3. Chapter 5 discusses the three studies collectively. Chapter 6 is the conclusion of the three dissertation studies as a whole and describes theoretical and pedagogical implications of my findings from the three dissertation studies.

CHAPTER 2: Study 1

Research Question

In Study 1, I explored the relation of Korean Grade 7 EFL students' morphological awareness to vocabulary, word reading, and reading comprehension in their Korean (L1). My research question is as follows. How is Korean Grade 7 EFL students' morphological awareness directly or indirectly associated with vocabulary, word reading, and reading comprehension in Korean?

Theoretical Framework

This study is grounded on DIER (Y.-S. Kim, 2020a, 2020b, 2023) as DIER specifies the nature of associations of multiple language, literacy, and cognitive skills including morphological awareness. According to DIER, morphological awareness is related to reading comprehension in two pathways: through vocabulary and through word reading. Morphological awareness is important to word reading because words' morphological information is represented in their spellings in languages with morphophonological or morphosyllabic writing systems (Adams, 1990; Carlisle, 2000; Goodwin & Ahn, 2010, 2013; Y.-S. Kim, 2020b; Kuo & Anderson, 2006; Nagy et al., 2006) or abjad writing systems (Asadi et al., 2017; Eviatar et al., 2018; Vaknin-Nusbaum et al. 2016; Vaknin-Nusbaum, 2018). In English which is a morphophonological language, for example, one's ability to recognize constituent morphemes of complex words (e.g., "farm" and "-er" in the word "farmer") can aid the reading of these multimorphemic words.

Morphological awareness also contributes to reading comprehension via vocabulary, listening comprehension, and text reading fluency (Goodwin & Ahn, 2013; Kieffer & Box, 2013; Y.-S. Kim et al., 2020; Nagy et al., 2006). As morpheme is the smallest meaning unit that builds

up a word (Bowers et al., 2010; Goodwin & Ahn, 2013; Lee et al., 2022; Reed, 2008), it is also considered a subdimension of words (Kieffer & Lesaux, 2012). Words are either morphemes themselves (if they are monomorphemic words) or consist of morphemes that carry certain meanings (if they are multimorphemic words). Therefore, knowledge of morphemes and the ability to identify constituent morphemes of words can facilitate comprehension of the words. (Goodwin & Ahn, 2013; Goodwin et al., 2012; Kuo & Anderson, 2006; Nagy et al., 2006). In other words, one's knowledge of morphemes that constitute complex words can help their comprehension of these words whose meanings are otherwise incomprehensible (Goodwin & Ahn, 2010, 2013; Nagy et al., 2006).

The two pathways by which morphological awareness contributes to reading comprehension are in line with the Morphological Pathways Framework (Levesque et al., 2021), which states that morphological awareness facilitates reading comprehension through morphological decoding and morphological analysis. Morphological decoding takes place as morphological information is used in decoding words. This is critical as one goes through morpho-orthographic processing of words in their lexical representation. In morphological analysis, one processes semantic information in each morpheme—the process through which readers are able to comprehend words using the meaning of the morphemes. To illustrate, recognizing the morphemes "base" and "ball" of the word "baseball" in reading is likely to help in identifying and deducing the meaning of the word as one first recognizes and reads each morpheme (morphological decoding) and comprehends their meanings in combination (morphological analysis). In other words, the text that has the word "baseball" will be comprehensible through the process of morphological decoding and morphological analysis.

By now, a large body of evidence has shown that morphological awareness is related to

language and literacy skills in line with DIER (Y.-S. Kim, 2020a, 2020b, 2023). For English-speaking students, morphological awareness was related with vocabulary (e.g., Goodwin et al., 2017; Spencer et al., 2015), word reading (e.g., Nagy et al., 2003; Ramirez et al., 2010), and reading comprehension (e.g., Kieffer & Lesaux, 2008; McCutchen et al., 2008). Similar findings were reported in languages other than English. Morphological awareness was associated with vocabulary (e.g., Y.-S. Kim, 2010; McBride-Chang et al., 2008), word reading (e.g., Cho & McBride-Chang, 2018; Cho et al., 2008), and reading comprehension (e.g., Bae & Joshi, 2017; Y.-S. Kim, 2011) for Korean students. Morphological awareness was also found to be associated with vocabulary, word reading, and reading comprehension in Arabic (e.g., Asadi et al., 2017; Eviatar et al., 2018), Chinese (e.g., McBride-Chang et al., 2005; Zhang et al., 2019), Hebrew (e.g., Eviatar et al., 2018; Vaknin-Nusbaum et al., 2016; Vaknin-Nusbaun, 2018), French (e.g., Casalis & Colé, 2009; Deacon et al., 2009) and Spanish (e.g., Ramirez et al., 2010; Simpson et al., 2020).

Although previous studies on morphological awareness and its relation to reading are highly informative, there are at least two important gaps. First, the majority of previous studies were on primary grade students and only a few involved adolescent readers. For example, two studies from Bae and Joshi (2017 & 2018) found from Korean-speaking students in their Grades 5 and 6 that morphological awareness contributed to vocabulary and reading comprehension over and above phonological and orthographic awareness in Korean and English. In addition, Ramirez and colleagues (2010) explored the relation of derivational morphological awareness with word reading on Spanish-speaking Grades 4 and 7 students, and found their significant associations both in Spanish and English over and above age, non-verbal skills, working memory, vocabulary, and phonological awareness. Although oral language skills, including morphology, develop

rapidly in early childhood, oral language skills and reading skills continue to develop into adolescence (Snow & Biancarosa, 2003).

A second gap is that although theoretical models such as DIER (Y.-S. Kim, 2020a, 2020b, 2023) hypothesizes direct and indirect relations of morphological awareness to reading comprehension, the vast majority of empirical studies examined direct relations (see above). However, a growing number of recent studies examined direct and indirect relations and found support for the two hypothesized pathways: indirect relations of morphological awareness to reading comprehension via vocabulary (e.g., Kieffer & Box, 2013; Y.-S. Kim et al., 2020; Gottardo et al., 2018) and word reading (e.g., Deacon et al., 2014; Kieffer & Box, 2013; Kieffer et al., 2013; Y.-S. Kim et al., 2020; Levesque et al., 2017). For example, Kieffer and Box (2013) found from Spanish-speaking language minority students and native English-speaking students that morphological awareness predicted reading comprehension both directly and indirectly via vocabulary and word reading in English, and the magnitude of the indirect effect was larger for native-speaker students of English than language minority peers. Deacon and colleagues (2014) also found from English-speaking students in Grades 3 and 4 that word reading was a partial mediator of the relation of their morphological awareness to reading comprehension over and above age, vocabulary, phonological awareness, and non-verbal ability. I addressed these gaps by examining direct and indirect relations of morphological awareness, vocabulary, and word reading to reading comprehension, using data from Korean adolescents.

Korean Morphology

Even though the Korean writing system is not as opaque compared to English (Y.-S. Kim et al., 2015; Wang et al., 2006, 2009), Korean employs morphophonological principles as does English (Cho & McBride-Chang, 2018; Y.-S. Kim, 2011; Perfetti & Dunlap, 2008; Sohn, 1999).

In other words, morphological information is retained over phonological information in Korean. For example, the words "깊다 (deep)" and "깊이 (depth)" share the morpheme "깊" that contains the meaning "deep" whereas the pronunciation of this common morpheme "깊" is different between them where in the former it is pronounced as /gip/ and the latter is pronounced as /gi/. In this example, the spelling of the words retained the morphological information (깊) at the cost of phonological information (/gip/ versus /gi/), rendering Korean language morphologically informative but phonologically inconsistent (Cho & McBride-Chang, 2018; Y.-S. Kim, 2010, 2011; Y.-S. Kim et al., 2015; Sohn, 1999).

Furthermore, Korean has rich inflectional, derivational, and compound morphemes as does English (Cho & McBride-Chang, 2018; Y.-S. Kim, 2010; Sohn, 1999). Please see Table 1 for examples of inflectional, derivational, and compound morphemes in Korean in comparison to English. Korean and English share many inflectional morphemes that function as pluralization (e.g., -들, -s/es), past tense (e.g., -했다, -ed), and possessive (e.g., -의, -'s). A conspicuous difference, however, is that Korean has richer inflectional morphemes than English. One of the characteristics that attribute to the variety of inflectional morphemes in Korean is that there are different levels of politeness or formality in Korean which does not exist in English (Sohn, 1999). Specifically, there are three major levels of formality in Korean: informal (e.g., 먹는다), semi-formal (e.g., 먹어요), and formal level (e.g., 먹습니다). This variety holds regardless of the tense and type of sentence (see Table 1). In addition, inflectional morphemes function as nominal case particles which in English is visible from the verb rather than inflectional morphemes (Sohn, 1999). To illustrate, depending on the subject, there are inflectional morphemes that function as nominal case particles in Korean (e.g., -은/는/이/가) that vary by the pronunciation of the subject's coda. In English, this is indicated by the use of verbs (e.g., am/are/is) and there are

no inflectional morphemes that function as such.

Derivational and compound morphemes are similar between Korean and English in terms of their functions and types (Sohn, 1999). For example, there are a wide range of prefixes and suffixes as derivational morphemes in both Korean and English that share their functions such as negation (e.g, 부-/불-/미-; dis-/un-/il-), emphasis (e.g., 최-; super-), and nominalization (e.g., -함 /-화; -ness/-tion/-sion). On the other hand, whereas English has derivational morpheme for comparative (-er) and superlative (-est), Korean does not and instead use the adverbs '더 (more)' and '가장 (the most).' For compound morphemes, both Korean and English form compound nouns with nouns as compound morphemes (e.g., basket + ball = basketball; 봄 + 비 = 봄비) and compound adjectives with adjectives as compound morphemes (e.g., dark + brown = dark-brown; 검 +붉다 = 검붉다).

Reading Development of Korean Students

Since Korean is an alphabetic language that uses an alphabet (called Hangul), and is orthographically shallow compared to English (Y.-S. Kim, 2011; Sohn, 1999), phonological awareness along with letter-sound knowledge and orthographic awareness is critical in young Korean students' early reading development (Y.-S. Kim, 2011). In addition, as stated in the previous section, Korean is a morphophonological language where morphological information is encoded in the spelling (Y.-S. Kim, 2010; Lee et al., 2022; Sohn, 1999). Perhaps not surprisingly, Korean-speakers' morphological awareness was related to vocabulary (e.g., Bae & Joshi, 2017; Y.-S. Kim, 2010), word reading (e.g., Y.-S. Kim, 2011; Wang et al., 2009), and reading comprehension (e.g., Bae & Joshi, 2017; Y.-S. Kim, 2011; Wang et al., 2009). For example, Bae and Joshi (2017) found from Grades 5 and 6 Korean bilingual students of Korean and English that their morphological awareness contributed to vocabulary (.62) and reading comprehension

(.54) over and above phonological and orthographic awareness in Korean. Similarly, Wang and colleagues (2009) found from Korean-English bilingual students in Grades 2 to 4 that morphological awareness supported word reading (.43) and reading comprehension (.39) over and above age, home language practice, vocabulary, and phonological awareness.

Hypotheses

I hypothesized, based on DIER (Y.-S. Kim, 2020a, 2020b, 2023) and the literature (e.g., Goodwin & Ahn, 2010, 2013; Lee et al., 2022; Kuo & Anderson, 2006), that there would be positive relations of their morphological awareness to vocabulary, word reading, and reading comprehension for Korean adolescents. In addition, according to DIER, I expected both vocabulary and word reading to be mediators of the relation of morphological awareness to reading comprehension.

Methodology

Participants

Grade 7 students (N = 121, 73 boys and 48 girls) who did not have identified severe behavioral challenges and diagnosed sensory or intellectual disabilities from the two middle schools in a metropolitan city in South Korea were invited to participate in this study. One school serves only male students whereas the other school serves only female students. The boy's school was situated in an area where the majority of students were from the mid socio-economic status (SES) families whereas the girl's school was located in an area where the majority of students were from mid to low SES families. Korean language curriculum in these schools in Grade 7 included the principles and examples of Korean morphology whereas English curriculum did not include explicit teaching of morphemes such as prefixes, suffixes, and root words. For Korean curriculum, the reading instruction does not necessarily focus on morphology, but there is a

chapter on morphology that teaches students what morphology is and how to identify morphemes. For English curriculum in Grade 7 focused on basic grammatical structures (e.g., article, tense, sentence structure) and rudimentary level vocabulary for beginner English learners. The students on this grade level learn vocabulary mostly through rote-memorization and are not intensively taught the widely used prefixes or suffixes. An oral assent from the students and written parent permission were obtained. All students spoke Korean as their first language, and one participant was from a multicultural background.

Measures

All the measures below were piloted and revised using data from Grade 7 students (N = 22). All the assessments were administered in a group setting whereas word reading was individually administered. Unless otherwise noted, items were dichotomously scored (1 = correct; 0 = incorrect).

Morphological Awareness

The student's morphological awareness was assessed with the adapted morphological awareness tests that have been used widely in English (Kirby et al., 2012). There were 15 items respectively for the inflectional, derivational, and compound morphological awareness. These tasks were presented in a written form where the test administrator read out the practice items and had the students read the test items by themselves. This measure was administered in a group setting.

Inflectional Morphological Awareness. The Word Analogy Test (Kirby et al., 2012) was adapted. In this test, the participants were asked to fill in the blank following the pattern of the given example. The participants were asked to figure out the pattern in the words A:B, and apply this pattern to C:D (e.g., push : pushed = jump : jumped; 밀다 : 밀었다 = 뛰다 : 뛰었다).

There were two practice items. The test items included the past tense (e.g., -했다), future tense (e.g., -것이다), negation (e.g., -않다), and passive voice (e.g., -졌다). Plural and possessive forms were not included, because in Korean, these rules are often not strictly abided by. Cronbach's alpha was .67. We acknowledge that this reliability measure is lower than ideal, which is likely to have been due to the ceiling effect of this measure for my participants (see the limitations section).

Derivational Morphological Awareness. Derivational morphological awareness was measured drawing on two tests: adapted versions of the Word Analogy Test (Kirby et al., 2012) and Comes From Task (Muse, 2005). The format and procedure of the Word Analogy Test was same as mentioned in the previous section in inflectional morphological awareness, but the items asked the students′ awareness of derivational morphemes (e.g., walker : walk = teacher : teach; 결정 : 결정하다 = 게임 : 게임하다). There were three practice items and eight test items. Some examples of derivational morphemes for this section were personification suffixes (e.g., -사 which works as ″-er″ in English that indicates a person who does something), nominalization suffixes (e.g., -기 which works as ″-tion″ in English), and prefixes (e.g., 미-, 최- which means "un-" and "super-" respectively in English). These derivational morphemes function similarly to those in English.

The Comes From Task provided students with a pair of words and asked whether the second word is the derived form of the first word. There were two practice items, one of which the answer is yes (e.g., teach and teacher; 빠르다 and 빨리) and the other of which the answer is no (doll and dollar; 딸 and 딸기). There were seven test items. However, two items were

removed because of low item-total correlations, and therefore, five items were used in the analysis. Across the two tasks, there was a total of 13 items (8 items from the Word Analogy task and 5 items form the Comes From task). Cronbach's alpha was .58. Note that this Cronbach's alpha value is less than ideal most likely due to the ceiling effect of this assessment on my participants (see the limitations section).

Compound Morphological Awareness. To assess the students' compound morphological awareness, the Korean adapted Bee Grass Test (Muse, 2005) and the morphological awareness subtest of the Korean Test of Literacy Diagnosis (K-TOLD; Cho et al., 2017), a norm-referenced Korean language and literacy skills assessment, were used. In the Bee Grass Test, students were asked to mark from two answer choices the one that better answers the riddle (e.g., Which is a better name for a bee that lives in the grass? A grass bee or a bee grass?; '버섯 모양의 사탕'에 대한 이름으로 어느 것이 적당할까요? 버섯사탕일까요 아니면 사탕버섯일까요?). In addition, morphological awareness subtest of K-TOLD (Cho et al., 2017) asked the students to produce a compound word with compounding two words in Korean (e.g., Early in the morning, we can see the sun coming up. This is called a sunrise. At night, we might also see the moon coming up. What could we call this? Moonrise; 냉장고 안에 김치를 보관하면 김치 냉장고라고 불러요. 그러면 냉장고 안에 꽃을 보관하면 무엇이라고 부를까요? 꽃 냉장고). There were two practice items followed by eight items on this test. There were four practice items and 15 test items. Cronbach's alpha was .61. Granted, this reliability coefficient is lower than ideal likely due to the ceiling effect of this assessment on my participants (see the limitations section).

Vocabulary

The Receptive and Expressive Vocabulary Test was used (REVT; Y.-T. Kim et al., 2009). REVT is a norm-referenced picture vocabulary test. For each item there were four pictures, and the students were asked to mark the right picture of the word that had been called out to them. Whereas this test is to be administered individually, due to the time constraint, REVT was administered as a whole class. I used 30 items that were relevant for our participants age—those for age 13 to adults. Each target word was read out twice by the assessor, and the students were asked to mark the appropriate picture for each word. There were 30 test items. However, four items were removed due to low item-total correlations, leaving the total of 26 items. Cronbach's alpha was .74.

Word Reading

The students' word reading proficiency in Korean was assessed with word reading subtest of K-TOLD (Cho et al., 2017). This assessment took place individually with each student. Each student was given a word list composed of 192 Korean words, the combination of words from both Forms A and B listed in an ascending order of difficulty. They were asked to read the words as accurately and quickly as possible in 45 seconds. The students' score of this test was the number of words they read correctly in 45 seconds. The test-retest reliability of this measure based on the pilot test was .94.

Reading Comprehension

The Korean language section of the National Student Diagnostic Test appropriate was used. This norm-referenced test is published by the Korean Institute for Curriculum and Evaluation. In the present study, I used a version from the year 2012 because that was the last year that the test was implemented to Grade 6, the grade level that was the closest to our target students' grade level. The test was administered in a whole group, and the students were allowed

40 minutes to complete the test. The test was composed of 23 multiple choice items, 3 open-ended short answer items, and 2 brief (2-5 sentences) essay items. Multiple-choice items were scored dichotomously (1 = correct; 0 = incorrect). Open-ended short answer items were scored 0 to 2 depending on the precision. Brief essay items were scored 0 to 3 depending on the degree of following the provided three guidelines (e.g., The response should 2-3 sentences long, use two examples from the table, use the phrase "it is not over until it is over"). The inter-rater reliability for the scoring of open-ended and essay questions between the first author and a research assistant was 96%. The total possible score on this test was 35. Cronbach's alpha was .87.

Procedure

The parent consent form and student assent form were distributed. Those who have returned the parent consent form signed by one of their parents and have verbally indicated their assent to participate in the study were our final participants to this study. A single study flyer, parent consent form, and child assent form contained all information relevant to Study 1, 2, and 3 altogether since these studies shared similar research procedure.

All assessments listed in Measures section took place in the school sites during regular English classes. Before the initiation of each assessment, I explained each type of tests with the given practice items so that the students could understand the direction of each test clearly. A pilot study was conducted with one class ($N = 22$), and items were revised based on the findings from the pilot study, which was used in the main study reported here.

Data Analysis

I used structural equation modeling (SEM) shown in Figure 1 using MPlus version 8 (Muthén & Muthén, 1998–2012) to answer our research question. A latent variable was created for morphological awareness based on the three indicators—inflectional, derivational, and

compound morphological awareness—whereas word reading, vocabulary, and reading comprehension were observed variables as they were measured by single measures. Before addressing the research questions including morphological awareness, I fitted a preliminary model that examined the direct relations among vocabulary, word reading, and reading comprehension to establish their relations (i.e., vocabulary and word reading predict reading comprehension; Model 1 in Figure 1). Next, the two alternative models were fitted for the direct and indirect relations among morphological awareness, vocabulary, word reading, and reading comprehension (Models 2 and 3 in Figure 1). Model 2 hypothesized both direct relation of morphological awareness to reading comprehension and their indirect relations through vocabulary and word reading, whereas Model 3 hypothesized only indirect relations between morphological awareness and reading comprehension via vocabulary and word reading and no direct relation. In Models 2 and 3, the indirect relations are those of morphological awareness to reading comprehension through vocabulary and word reading as mediators, and the rest are direct relations.

1 used Full Information Maximum Likelihood as the estimator; and used chi-square, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residuals (SRMR) as model fit indices. Typically, RMSEA values below .08, CFI and TLI values above .90, and SRMR values below .10 indicate an acceptable model fit (Kline, 2005).

Results

Descriptive Statistics and Preliminary Analysis

Descriptive statistics of the students' means, standard deviations, minimum and maximum scores, skewness, and kurtosis for each assessment are shown in Table 2. All skewness

values within +/-3 and those of kurtosis within +/-7 indicate that distributional properties of all variables are appropriate for our analyses (West et al., 1995). Bivariate correlations among the variables are in Table 3. All variables were significantly related with *r*s ranging from .19 to .56.

The Relation of Morphological Awareness to Vocabulary, Word Reading, and Reading Comprehension

I first examined the relations among vocabulary, word reading, and reading comprehension without morphological awareness (see Model 1 of Figure 1). This is a just-identified model and therefore, model fit information is not available. According to this model, vocabulary (.39, $p < .001$) and word reading (.32, $p < .001$) predicted reading comprehension. Then I tested Models 2 and 3 and model fit were as follows: Model 2: $\chi 2$ (*df*) = 1.02 (7), p = 1.00, RMSEA = .00 [.00, .00], CFI = 1.00, TLI = 1.00, SRMR = .01; Model 3: $\chi 2$ (*df*) = 32.56 (8), $p < .001$, RMSEA = .16 [.11, .22], CFI = .87, TLI = .75, SRMR = .10. According to the chi-square difference test, Model 2 had a superior model fit than Model 3 ($\Delta\chi 2 = 31.54$, $\Delta df = 1$, $p < .001$). In other words, vocabulary and word reading did not fully mediate the relation of morphological awareness to reading comprehension. Instead, there was a direct relation from morphological awareness to reading comprehension over and above vocabulary and word reading. As seen in Figure 2, there were significant relations of morphological awareness to reading comprehension (.62, $p < .001$), vocabulary (.56, $p < .001$), and word reading (.35, $p < .001$). In terms of indirect relations, word reading was a significant mediator of the relation of morphological awareness to reading comprehension (the product of the coefficients of morphological awareness with word reading and of word reading and reading comprehension = .06, $p = .03$) whereas vocabulary was not. I also ran a post hoc analysis on Model 2 but with morphological awareness as a latent variable of derivational and compound morphological

awareness only, because substantial number of inflectional morphemes in Korean play grammatical roles (Sohn, 1999) and thus students' grammatical knowledge could have confounded our findings. The model fit of this alternative model was as follows: $\chi 2$ (df) = .51 (3), p = .92, RMSEA = .00 [.00, .06], CFI = 1.00, TLI = 1.00, SRMR = .01. According to the chi-square difference test, this model did not significantly improve the original model ($\Delta\chi 2$ = .51, Δdf = 4, p = .97) and thus I selected our original model as the final model. The results of these models were very similar.

Discussion

The goal of my study was to examine the direct and indirect relations of morphological awareness to vocabulary, word reading, and reading comprehension for Korean-speaking Grade 7 students. According to DIER (Y.-S. Kim, 2020a, 2020b, 2023), morphological awareness is a predictor for all the abovementioned skills where vocabulary and word reading mediate the relation of morphological awareness to reading comprehension.

Vocabulary and word reading predicted reading comprehension. This finding is in line with the role of orthographic and semantic processing of words (word reading and vocabulary respectively) in reading comprehension (Y.-S. Kim, 2020a, 2020b, 2023; Levesque et al., 2021; Nation, 2001; Perfetti & Stafura, 2014). This is consistent with the findings from English-speaking adolescent students that their reading comprehension was associated with vocabulary (e.g., Goodwin et al., 2017; Kieffer et al., 2013; Zhang & Koda, 2013) and word reading (e.g., Goodwin et al., 2017; Kieffer et al., 2013). When morphological awareness was added, the direct and indirect relations of morphological awareness to reading comprehension fit the data better. In other words, morphological awareness played a critical role in explaining the relation of vocabulary and word reading to reading comprehension. This is in align with the previous

findings (e.g., Y.-S. Kim, 2011; Kuo & Anderson, 2006; Lee et al., 2022; Nagy et al., 2006), including those with adolescent students (e.g., Goodwin et al., 2017; Kieffer et al., 2013). These results suggest that one's awareness of morphemes that make up complex words facilitates lexical processing through orthographic and semantic cues. My findings add to the growing literature of the relation of morphological awareness to vocabulary and word reading by providing findings from Korean middle school students, supporting DIER (Y.-S. Kim, 2020a, 2020b, 2023) and the Morphological Pathways Framework (Levesque et al., 2021).

As stated above, I hypothesized based on DIER (Y.-S. Kim, 2020a, 2020b, 2023) that vocabulary and word reading would mediate the relation of morphological awareness to reading comprehension, and the mediational relation would be stronger via vocabulary than word reading. Interestingly, however, morphological awareness had a direct relation to reading comprehension over and above vocabulary and word reading, and the magnitude of their direct relation was stronger than that of their indirect relations via word reading (.62 versus .06). In addition, vocabulary was no longer related to reading comprehension once morphological awareness was added to the model (Model 1 versus Model 3), and nor did it mediate the relation of morphological awareness with reading comprehension. The direct relation of morphological awareness to reading comprehension is similar to previous studies with English-speaking students. For example, Kieffer and colleagues (2013) found that morphological awareness was directly related to reading comprehension over and above vocabulary, word reading, text reading fluency, and listening comprehension for Spanish-speaking English bilinguals in Grades 6, 7, and 8. Levesque and colleagues (2017) also found that morphological awareness was directly related to reading comprehension and indirectly via morphological decoding, word reading, and morphological analysis for English-speaking students in Grade 3. The nonsignificant relation of

vocabulary to reading comprehension once morphological awareness was included was also reported in Levesque et al. (2017). There might be several explanations for the direct relation of morphological awareness over and above vocabulary to reading comprehension. One explanation is the dynamic relations hypothesis of DIER, according to which the direct and indirect relations of component skills to reading comprehension vary as a function of several factors, including measurement of constructs. In the present study, morphological awareness was measured comprehensively including inflectional, derivational, and compound morphology, and using a latent variable approach which minimizes measurement error. In contrast, vocabulary, word reading, and reading comprehension were measured with single tasks and using observed variables, and therefore, these constructs were not measured as precisely as morphological awareness. Therefore, it is possible that results might differ if vocabulary, word reading, and reading comprehension were also measured with multiple tasks and using latent variables. Future studies are warranted to investigate this speculation.

A second potential related explanation is that morphological awareness construct included inflectional morphology which plays grammatical roles, in addition to derivational and compound morphemes. The extent of the relation between morphological awareness and vocabulary would be primarily determined by derivational and compound morphology, not inflectional morphology. Therefore, the grammatical aspect captured in the morphological awareness latent variable may have led to its independent relation to reading comprehension over and above vocabulary. To explore this speculation, I conducted a post hoc analysis and found that the results were very similar with and without inflectional morphological awareness.

A third possibility is that students' morphological processing of words through morphological decoding and morphological analysis may have been a more prominent skill that

mediated the association of morphological awareness to reading comprehension instead of their knowledge of vocabulary (Levesque et al., 2017, 2021). This is because one's morphological processing is a substantial mechanism through which students process words of which they are not familiar with the meaning. According to Levesque and colleagues (2017) and Nagy and colleagues (2006), English-speaking elementary grade students' oral language skills are not yet fully developed, and until these young students' vocabulary knowledge matures, morphological processing is likely to substitute the contribution of vocabulary in reading comprehension. I am not clear whether this would hold for our adolescents in Grade 7, and future studies are needed to test the hypothesis about the students' vocabulary level and the relative role of morphological processing in reading comprehension.

My last potential reason may be due to the nature of the items in our vocabulary measure. The items that constitute REVT (Y.-T. Kim et al., 2009) are mostly monomorphemic words, and this might explain the present findings. In other words, measurement of vocabulary may be an important factor in accurately capturing the mediating role of vocabulary in the relation of morphological awareness to reading comprehension. Again, future studies are warranted to investigate this speculation.

Limitations and Future Directions

There are a few limitations to my study. First, morphological awareness measures had overall lower-than-ideal internal consistency estimates. Even though I used a latent variable approach, which would alleviate the concern, the low internal consistency of these assessments is certainly a limitation. Moreover, morphological awareness is the only latent variable with three subtests—inflectional, derivational, and compound morphological awareness—whereas the rest variables were measured by single tasks. Future studies need to replicate the present study using

multiple measures and latent variables for vocabulary, word reading, and reading comprehension for greater precision in findings. In addition, morphological awareness was administered in written context because adolescents in my study were expected to have developed proficient word reading and therefore, administration in written context was not hypothesized to present challenges to students. However, I acknowledge that this might have had undue influence on the relation of morphological awareness to word reading and reading comprehension. Last but not least, my study explored the relation of morphological awareness to vocabulary, word reading, and reading comprehension, but I did not examine the mechanisms through which these hierarchical relations hold. In my future study, I can explore additional variables that explain the mechanism of morphological processing (e.g., morphological decoding, morphological analysis; see Levesque et al., 2017, 2021; text reading fluency, listening comprehension; Kim, 2020a, 2020b, 2023) to better explain the associations of morphological awareness to language and reading skills.

My findings illustrate the importance of morphological awareness in explaining development of Korean middle school students' language and literacy skills such as vocabulary, word reading, and reading comprehension, the skills which are all critical for the students' academic success (Nation, 2001). Even though I am cautious to make a causal claim since correlation does not indicate causation, the positive relations I found suggest that systematic and explicit instruction on morphological awareness is likely to be helpful for Korean-speaking middle school students' vocabulary, word reading, and reading comprehension. Future instructional studies are needed to explore this speculation. To this end, my study makes a unique contribution to the field of language and reading in that I have found the positive direct and indirect associations of morphological awareness to other language and reading skills for Korean

adolescents as well as what is predominantly found in English-speaking students in comparable developmental phases of reading (e.g., Carlisle, 2000; Kieffer & Box, 2013; Nagy et al., 2003). Both Korean and English being morphologically informative languages (Kuo & Anderson, 2006; Sohn, 1999), my findings have further underscored the importance of students' morphological awareness in the development of other language and reading skills such as vocabulary, word reading, and reading comprehension in languages with the morphophonological writing system.

CHAPTER 3: Study 2

Research Questions

Study 2 further delved into the cross-linguistic relation of morphological awareness, vocabulary, word reading, and reading comprehension across the Korean Grade 7 EFL students' L1 (Korean) and L2 (English). Specifically, the research questions of this study are as follows. First, what is the dimensionality of morphological awareness in Korean and English for Korean-speaking Grade 7 EFL students? Second, how is morphological awareness related to vocabulary, word reading, and reading comprehension across Korean and English?

Literature Review

Dimensionality of Morphological Awareness

Although many prior studies measured morphological awareness using a single task (e.g., Casalis & Colé, 2009; Lam & Chen, 2018; McBride-Chang et al., 2008), morphological awareness is indeed a multidimensional construct (Graves, 2006; Koda, 2005). There are three types of morphemes that differ in functions and have varying developmental trajectories—inflectional, derivational, and compound morphemes (Kuo & Anderson, 2006; Nagy et al., 2006; please see their definitions on Chapter 1). Awareness in the aforementioned morphemes develops during different periods (Kuo & Anderson, 2006). As an example, for English speakers, development of inflectional and compound morphological awareness precedes that of derivational morphological awareness because derivation involves more irregular shifts in word form than inflection and compounding (Carlisle & Katz, 2006; Koda, 2005). To be more specific, derivative words in English often go through phonological shift (e.g., "heal" and "health"), rendering the identification of the relation between these two words opaquer than inflectional and compound morphological shifts. Whereas students reach ceiling in inflectional and

compound morphological awareness in primary grade levels, derivational morphological awareness continues developing until adulthood (Goodwin & Ahn, 2013; Carlisle & Katz, 2006; Koda, 2005; Kuo & Anderson, 2006). Similar developmental progression also holds true for Korean speakers as well because Korean shares similar morphological traits with English (Sohn, 1999; Yeon et al., 2017; will be further discussed in a following section). Thus, it would be informative to examine the dimensionality of morphological awareness in Korean and English languages by all these three types of morphological awareness.

Dimensionality of morphological awareness was explored in several studies in different ways. Goodwin and colleagues (2017), for example, explored the dimensionality of morphological awareness on English L1 speaking students in Grades 7 and 8 using seven morphological awareness tasks—suffix choice tasks with real words and pseudowords that asked students to choose the correct derivational form of words; morphological judgment task that asked students to judge whether two given words were morphologically related; generation of morphologically related words that asked students to produce as many morphologically related words of given root words as possible; and processing of morphological spelling, morphological meaning, and morphological word reading using given root words as clues. The findings showed that the students' morphological awareness was multidimensional as in a bifactor model that was composed of general morphological knowledge and the seven aforementioned subskills. Tighe and Schatschneider (2015) tested three sets of multidimensionality models of morphological awareness using data from L1 English-speaking adults in Adult Basic Education program on seven morphological subtests—inflectional versus derivational morphological awareness, tasks with real words versus pseudowords, and tasks with context versus without context. To test these models, they used the identical seven different morphological awareness tasks that were

mentioned above in Goodwin et al. (2017). The result indicates that morphological awareness was multidimensional by real word versus pseudoword items but not by the other two hypothesized distinctions of inflectional versus derivational morphological awareness and given context versus not given context for Adult Basic Education program students. These studies were conducted with English L1 speakers, and to my knowledge, there are no studies that explored dimensions of all inflectional, derivational, and compound morphological awareness, let alone in students' L1 and L2.

The Relation of Morphological Awareness with Vocabulary, Word Reading, and Reading Comprehension

According to the DIER (Y.-S. Kim, 2020a, 2020b, 2023), morphological awareness supports vocabulary and word reading, which, in turn, contribute to reading comprehension. In other words, the relation of morphological awareness to reading comprehension is mediated by vocabulary and word reading (e.g., Bae & Joshi, 2017; Kieffer & Box, 2013; Y.-S. Kim, et al., 2020). One's knowledge of morphemes can facilitate inferring meanings of unfamiliar words (Goodwin et al., 2013; Lee et al., 2022; Nagy et al., 2006). Meta-analyses (e.g., Ford-Connors & Paratore, 2015; Goodwin & Ahn, 2010, 2013; Lee et al., 2022; Tighe & Schatschneider, 2016) have found overall moderate and a positive relation of morphological awareness with vocabulary. Similar findings were reported for L2 speakers (e.g., Bae & Joshi, 2017; Kieffer & Lesaux, 2008; McBride-Chang et al., 2005).

Morphological awareness also makes a contribution to word reading along with phonological awareness and orthographic awareness (see the Triangle Model; Adams, 1990). Word reading is substantially influenced by one's ability to process morphemes in words because their ability to read the constituent morphemes of words through orthographic processing is

helpful to comprehending the text containing the words (Deacon et al., 2009; Y.-S. Kim, 2020b; Levesque et al., 2017, 2019, 2021). Studies have reported moderate and positive relation of morphological awareness with word reading (e.g., Goodwin & Ahn, 2010, 2013; Kieffer & Lesaux, 2008; Lee et al., 2022; Nagy et al., 2003) including those with L2 speakers of the languages (e.g., Farran et al., 2012; Ramirez et al., 2010).

Cross-Linguistic Relation of Morphological Awareness and Reading Skills across Languages

According to the Linguistic Interdependence hypothesis (Cummins, 1979, 1991, 2005), common underlying skills support development of L1 and L2 skills. As a result, even when learning two languages with different writing systems (e.g., English versus Chinese; see Bialystok et al., 2005), the proficiency in a language is positively associated with that in the other language. The Transfer Facilitation Model states that morphological awareness is one of the metacognitive skills that transfer between languages (Koda, 2005, 2007). One's L1 morphological awareness can support morphological awareness in L2 (Deacon et al., 2007; Tong & McBride-Chang, 2010; Ramirez et al., 2010).

The majority of previous studies on cross-linguistic association of language and literacy skills encompassing morphological awareness were done with bilingual students in the US. For example, Ramirez and colleagues (2010) found from Spanish-speaking English L2 speakers in Grade 7 that their morphological awareness in Spanish positively predicted their word reading in English, illustrating cross-linguistic association of morphological awareness with word reading between the students' Spanish and English. It is notable that the magnitude the aforementioned association across Spanish and English was as strong as that of morphological awareness to word reading within English. In contrast, the students' morphological awareness in English was not

associated with their word reading in Spanish. Wang and colleagues (2009) also found, from Korean bilingual students learning Korean and English in Grades 2 to 4, that their English morphological awareness and Korean word reading were cross-linguistically related. However, their Korean morphological awareness was not associated with English word reading, and there was no direct cross-linguistic relation between morphological awareness with reading comprehension between Korean and English. Whereas this study was informative in that it explored cross-linguistic associations of diverse language and reading skills—phonological awareness, derivational morphological awareness, oral vocabulary, word reading, and reading comprehension—this study did not examine their direct and indirect relations.

Hypotheses

I hypothesized multidimensionality of morphological awareness by language (Korean versus English). According to Korean educational curriculum, Grade 7 is when students begin learning English as their academic subject even though they begin to learn the letters and oral language pronunciations from Grade 3. As a result, English proficiency of the participants is elementary compared to their proficiency in Korean. Given the substantial differences in language proficiency in Korean and English, I postulated that the students' morphological awareness in Korean and English would be dissociable by language. I also expected that there would be cross-linguistic relations of morphological awareness, word reading, and reading comprehension between Korean and English in line with Linguistic Interdependence hypothesis (Cummins, 1979, 1991, 2005), Transfer Facilitation Model (Koda, 2005, 2007), and some empirical findings with Korean-English bilingual children (e.g., Bae & Joshi, 2017; Wang et al., 2006, 2009). Lastly, I hypothesized that morphological awareness in L1 (Korean) would predict L2 (English) reading comprehension via English morphological awareness, which would then

predict English vocabulary and word reading, because morphological awareness in the two languages is expected to be related (Cummins, 1979, 2005; Koda, 2007; Wang et al., 2009), and morphological awareness would then contribute to reading comprehension within English (Carlisle, 2000; Casalis & Colé, 2009; Deacon et al., 2014; Kieffer & Lesaux, 2008).

Methodology

Participants

The information of the participants in this study is same as that of Study 1.

Measures

Same as Study 1, all the measures below were implemented to a classroom designated for the pilot test. Based on the results of the pilot test, some test items were adjusted in terms of difficulty or the length of the tests.

Korean Measures

Description of the Korean measures in morphological awareness, vocabulary, word reading, and reading comprehension are on the Measures section of Study 1.

English Measures

The English measures used parallel assessment materials in English with the aforementioned Korean measures appropriate for the participants' level of English proficiency.

Morphological Awareness. I used the morphological awareness measures that were parallel to the Korean morphological awareness assessments mentioned above.

Inflectional Morphological Awareness. I adjusted the Word Analogy Test (Kirby et al., 2012) to measure the students' inflectional morphological awareness, and the description of this test is same as its comparative measure in Korean. The test items for English included the pluralization (e.g., -s/es), the past tense (e.g., -ed), the comparative (e.g., -er), the superlative

(e.g., -est), and their irregular forms (e.g., person - people, keep - kept). Spelling errors were not penalized because our focus of this assessment was to assess how students apply morphological rules correctly and less on spelling. For overgeneralization of inflectional rules (e.g., child – childs, say - sayed), partial credit of 0.5 was given, because these overgeneralizations indicate students do have morphological awareness albeit not fully accurate. Cronbach's alpha was .93.

Derivational Morphological Awareness. I assessed the students' derivational morphological awareness in English using the identical two subtests as Korean measures but in English: adapted versions of the Word Analogy Test (Kirby et al., 2012) and Comes From Task (Muse, 2005). As was the case for inflectional morphological awareness, spelling errors were not penalized and partial credit of 0.5 point was given for overgeneralization of derivational rules. Cronbach's alpha across both tests was .84.

Compound Morphological Awareness. I tested the students' compound morphological awareness with two subtests that were parallel to the Korean measures in the same assessment: Bee Grass Test and Compound Construction Test (Muse, 2005). Compound Construction Test had the same test format with K-TOLD morphological awareness test mentioned above. Cronbach's alpha across all the items was .84.

Vocabulary. Peabody Picture Vocabulary Test-4 (PPVT-4; Dunn & Dunn, 2007) was used to assess the students' English vocabulary. While this assessment is designed for individual administration, due to the time constraint, this test was administered in a group setting. Based on the finding from the pilot study, 30 items appropriate for the participants' vocabulary level were chosen. Same as REVT (Y.-T. Kim et al., 2009) described above, each item had four picture choices, and the assessor read out each target word twice to the students. The students were then asked to mark the appropriate picture that corresponds to the words they heard. Cronbach's alpha

was .81.

Word Reading. The Sight Word Efficiency subtest of Test of Word Reading Efficiency (TOWRE-2; Torgesen et al., 2012) was used to assess the students' English word reading fluency. Same as the abovementioned Korean word reading measure, this assessment was administered individually. Each student was shown a list of 104 English words in an increasing order of difficulty and was asked to read the words out as accurately and quickly as possible in 45 seconds. The test-retest reliability was .98.

Reading Comprehension. I used the reading comprehension subtest of Wechsler Individual Achievement Test-2 (WIAT-2; Johnson, 2011). After reading passages, students were asked to answer 26 open-ended questions and one multiple-choice question. Based on the pilot sample's performance in this task, twenty-seven items for English-speakers in grades K through 3 were selected. All questions were presented in Korean, and the students were directed to write their responses in Korean as detailed as possible. Each short answer question was worth 2 points (2 = completely correct; 1 = partially correct; 0 = completely incorrect or blank response). Response to the multiple-choice question was scored dichotomously (1 = correct; 0 = incorrect). The inter-rater reliability for open-ended questions was 95% between the first author and the research assistant, and Cronbach's alpha was .93.

Procedure

The procedure of this study was equal to that of Study 1. Each measure was administered in Korean followed by English in the order of vocabulary, word reading, morphological awareness, and reading comprehension.

Data Analysis

I used confirmatory factor analysis (CFA) and SEM using MPlus version 8 (Muthén &

Muthén, 1998–2012) to address my research questions. I first tested three CFA models to test dimensionality of morphological awareness (see Figure 3). Model 1 was a unidimensional model (Figure 3a). Model 2 (Figure 3b) was a multidimensional model by type of morphological awareness (inflectional versus derivational versus compound morphological awareness), and Model 3 (Figure 3c) was a two-factor model by language (Korean versus English).

Based on my finding from the aforementioned CFA models, I fitted an SEM model shown in Figure 4. According to this hypothesized model, both within Korean and English, morphological awareness predicts vocabulary, word reading, and reading comprehension, and vocabulary and word reading are partial mediators of the relation of morphological awareness to reading comprehension based on DIER (Y.-S. Kim, 2020a, 2020b, 2023). Across Korean and English, in addition, I hypothesized cross-linguistic association between each skill—morphological awareness, word reading, and reading comprehension—based on the Linguistic Interdependence hypothesis (Cummins, 1979, 1991, 2005) and Transfer Facilitation Model (Koda, 2005, 2007) as metalinguistic awareness can apply to the students' both Korean and English in the aforementioned skills. Specifically, I postulated the cross-linguistic relation of word reading from Korean to English because students' metalinguistic awareness is likely to render the positive association of word reading of the students' L1 to L2 through their orthographic awareness (e.g., awareness of mapping between sound and graphic information) from a language to another (Gombert, 1992; Koda, 2007). Therefore, morphological awareness in Korean would contribute to reading comprehension in English through two pathways: through Korean reading comprehension and through English morphological awareness.

I used Maximum Likelihood with Robust Standard Errors (MLR) as the estimator because compound morphological awareness had a kurtosis value greater than 7, and evaluated

the model fit based on the same criteria as I did in Study 1.

Results

Descriptive Statistics and Preliminary Analysis

Descriptive statistics and correlation matrix are presented in Tables 2 and 3 respectively. Missing data ranges ranged from 0% in Korean and English word reading to 4% in Korean morphological awareness, and Little's test of data MCAR was not rejected ($\chi 2$ = 63.06, df = 55, p = .21). According to Table 2, all skewness values were within +/-3 and most of kurtosis values except one variable were within +/-7, indicating that distributional properties of the variables were mostly appropriate for my analyses (West et al., 1995). English compound morphological awareness had the kurtosis of 12.11 which was mainly due to the ceiling effect on my participants. For this reason, I used MLR as the estimator. As seen in Table 2, all variables within Korean (L1) and English (L2) were significantly correlated with coefficients ranging from .19 to .56 for Korean and .26 to .80 for English. Across Korean and English, the majority of variables were significantly correlated with coefficients ranging from .19 to .64. Overall, the magnitude of bivariate correlations was stronger within English compared to within Korean and across Korean and English.

Dimensionality of Morphological Awareness

I fitted CFA Models 1–3 in Figure 3 to test the dimensionality of morphological awareness. Please see Table 4 for model fit information and model fit comparisons across the models. According to the chi-square difference test, Model 2 significantly improved the model in comparison with Model 1 ($\Delta\chi 2$ = 15.74, Δdf = 3, p = .001). And then comparing Model 2 and Model 3, Model 3 significantly improved the model ($\Delta\chi 2$ = 10.56, Δdf = 2, p = .01). To this end, Model 3, the multidimensional model by language, was the best fitting factor model.

Standardized factor loading coefficients of my final CFA model (Model 3) are presented in Figure 5. The factor loadings for Korean morphological awareness were fairly strong (.66) to strong (.82); and those for English morphological awareness were moderate (.52) to very strong (.90, *p*s < .001). The two latent variables—morphological awareness in Korean and English—were strongly related ($r = .76$, $p < .001$).

The Relations among Morphological Awareness, Vocabulary, Word Reading, and Reading Comprehension within and between Korean and English

I fitted SEM Model 2 in Figure 4 based on my finding of multidimensionality of morphological awareness by language in Research Question 1. The model fit information is as follows: $\chi 2$ (*df*) = 98.88 (47), $p < .001$, RMSEA = .10 [.07, .12], CFI = .94, TLI = .92, SRMR = .07. Standardized coefficients of the model are presented in Figure 6. Both within Korean and English, the students' morphological awareness predicted vocabulary (.58, $p < .001$ in Korean and .89, $p < .001$ in English respectively), word reading (.38, $p < .001$ in Korean and .84, $p = .001$ in English respectively), and reading comprehension (.60, $p < .001$ in Korean and .58, $p < .001$ in English respectively). In Korean, word reading marginally mediated the relation of morphological awareness to reading comprehension (total indirect coefficient .06, $p = .08$) whereas it did not for English (total indirect coefficient .05, $p = .43$). For both Korean and English, vocabulary did not mediate the aforementioned relation (total indirect coefficient .05, $p = .41$ for Korean and total indirect coefficient .09, $p = .24$ for English).

Cross-linguistically, morphological awareness (.77, $p < .001$), word reading (.15, $p = .001$), and reading comprehension (.26, $p < .001$) in Korean predicted their counterpart skill in English. Then, morphological awareness in Korean predicted reading comprehension in English in two ways: first through Korean reading comprehension (total indirect coefficient .15, *p*

= .001), and then through English morphological awareness (total indirect coefficient .44, *p* = .001). For both pathways, within each language, neither vocabulary nor word reading mediated the relation of morphological awareness to reading comprehension in the pathway from Korean morphological awareness to English reading comprehension.

Discussion

I examined the dimensionality of morphological awareness across Korean and English languages, and then explored both within and cross-linguistic relations of morphological awareness, vocabulary, word reading, and reading comprehension between the two languages from Korean-speaking EFL middle school students. I found that morphological awareness was multidimensional by language. In other words, students' morphological awareness skill was dissociable by their Korean (L1) and English (L2) but strongly related at .76. The current findings may be due to differences in language proficiency between L1 and L2 for Korean EFL middle school students. This finding is a unique contribution to the field as no studies have tested dimensionality of morphological awareness in L1 and L2. My finding indicates that for beginner language learners such as EFL or emergent bilingual learners, their morphological awareness is distinguishable by language (L1 versus L2). With that said, a caution is needed in this implication as this finding may not be extrapolated to more advanced level students of both languages.

Comparing the relations of morphological awareness with vocabulary and word reading within each language, it is notable indeed that these relations are substantially weaker for Korean (.58 and .38 respectively for vocabulary) than English (.89 and .84 respectively for word reading). These differences in relation with morphological awareness is likely due to the overall ceiling effect of our participants on morphological awareness tasks in Korean, which was not the

case for English. For Korean students in lower grade level whose morphological awareness in Korean is yet underdeveloped, the associations of morphological awareness with vocabulary and word reading might be stronger than our finding on Korean middle school students. This speculation can be examined in future work.

Looking at the direct and indirect relations between Korean and English, I found that morphological awareness (.77), word reading (.15), and reading comprehension (.26) in Korean significantly predicted their corresponding skill in English. This finding is in align with Linguistic Interdependence hypothesis (Cummins, 1979, 1991, 2005) and Transfer Facilitation Model (Koda, 2005, 2007). To be more specific, EFL students as my participants may draw on their metalinguistic knowledge of L1 (Korean) to process L2 (English) for the three aforementioned skills (Gombert, 1992). Especially since Korean and English share similar morphological features all in inflectional, derivational, and compound morphemes (see Kuo & Anderson, 2006; Sohn, 1999), the participants may have been able to identify and manipulate morphological forms of English with ease with the application of their ability to do so in Korean (Bae & Joshi, 2017, 2018; Koda, 2007). For word reading, both Korean and English use morpho-phonological writing systems even though they use different alphabetic systems (Cho & McBride-Chang, 2018; Y.-S. Kim, 2011; Sohn, 1999). Since both Korean and English words are phonologically and morphologically informative, the students' ability to process sound and meaning information that is indispensable for word reading in Korean is likely to have aided their counterpart skills in English as well through the generally mapping skills of sound and graphic symbols across languages (Wang et al., 2009). Finally for reading comprehension, some general skills required for reading comprehension such as inference making, text structure knowledge, and familiarity to discourse markers may be shared across languages (Koda, 2007).

This may explain the cross-linguistic relation of reading comprehension I found between the participants' Korean and English. This finding is discrepant from existing literatures from the context of Korean-English bilingual students that found non-significant cross-linguistic relations between Korean morphological awareness to English reading comprehension (Bae & Joshi, 2017; Wang et al., 2009) likely due to the different developmental trajectories of these students' Korean and English in comparison with my participants. In other words, the participants in those studies were emergent bilinguals in Korean and English and thus their proficiency in Korean was not likely to have been as advanced as that of my participants for whom Korean was their everyday language and English being their foreign language they do not use daily.

Collectively exploring the direct and indirect relations of all measures, I found that the students' morphological awareness in Korean predicted their reading comprehension in English via two pathways. On the one hand, Korean morphological awareness predicted Korean reading comprehension (.60), which, in turn, predicted English reading comprehension (.26). On the other hand, Korean morphological awareness predicted English morphological awareness (.77), which, in turn, predicted English reading comprehension (.58). Looking at the first pathway through Korean reading comprehension as a mediator, morphological awareness in Korean may have supported their reading comprehension in Korean because morphological awareness supports the students' access to multimorphemic words and syntactic structures embedded in some morphemes that are necessary for comprehension of the texts (Goodwin & Ahn, 2013; also see The Reading Systems Framework; Perfetti & Stafura, 2014). Unlike DIER (Y.-S. Kim, 2020a, 2020b, 2023), however, vocabulary did not mediate the relation of morphological awareness with reading comprehension within Korean likely due to the nature of the vocabulary measure (REVT; Y.-T. Kim et al., 2009) of which the majority of the items were

monomorphemic words.

Next, looking at the second pathway through English morphological awareness as a mediator, neither vocabulary nor word reading in English worked as additional mediators of the relation of Korean morphological awareness to English reading comprehension through English morphological awareness that is discrepant from DIER (Y.-S. Kim, 2020a, 2020b, 2023). This may be because my participants were in a beginner stage of English language learning whose vocabulary size and word reading skills were yet rudimentary. With more advanced levels of vocabulary and word reading, these skills may have mediated the relation of morphological awareness to reading comprehension. Furthermore, the majority of vocabulary and word reading instruction occur through whole-word rote memorization rather than morphological instruction and systematic decoding in Korean EFL curriculum (Kang, 2012; Oller et al., 1998). In other words, instructional context may explain the present findings.

From practical perspective, my findings illustrate the potential benefits of students' development of morphological awareness in their first language not only to support acquisition of L1 language and reading skills but also to learn additional languages, although my correlational findings are not sufficient to make causal conclusions. Based on direct and indirect relations of morphological awareness, vocabulary, word reading, and reading comprehension within Korean middle school students' both Korean (L1) and English (L2), it is notable that morphological awareness supports reading comprehension in both languages. This finding illustrates the importance of explicit instruction of morphological awareness for improvement in reading comprehension in both first and foreign languages for middle school students. Furthermore, I found morphological awareness in the students' Korean even contributes to their reading comprehension in English.

Limitations and Future Directions

There are a few limitations in this study. First, for both Korean and English, morphological awareness was the only latent variable with three subskills (inflectional, derivational, and compound morphological awareness) whereas all the other variables were observed variables with a single task respectively. Future studies are needed that use multiple measures and latent variables for vocabulary, word reading, and reading comprehension. In addition, due to the limited sample size, I could not test more complex CFA models that test the dimensionality of morphological awareness such as second-order or bifactor models. Future studies should replicate the current study with a larger sample. Furthermore, mechanisms through which morphological awareness contributes to reading skills in both students' L1 and L2 are not explored in my study. Levesque and colleagues (2021) found morphological decoding and morphological analysis to be mechanisms through which morphological awareness supports reading comprehension in English-language speakers. Future studies are needed that examine the cross-linguistic relations of morphological awareness, vocabulary, word reading, and reading comprehension by adding these mechanisms.

CHAPTER 4: Study 3

Research Questions

Study 3 delved into the role of *morphological analysis*—one of the underlying procedures of using morphological awareness to semantically process constituent morphemes of complex words (Levesque et al., 2021)—in explaining the relations of morphological awareness, vocabulary, word reading, and reading comprehension in English for Korean EFL middle school students. The research questions of this study are as follows. How is morphological analysis related with morphological awareness, vocabulary, word reading, and reading comprehension in English for Korean-speaking EFL Grade 7 students? Does morphological analysis mediate the relation of morphological awareness to vocabulary, word reading, and reading comprehension in English for these students?

Theoretical Framework

The Relation of Morphological Awareness with Vocabulary, Word Reading, and Reading Comprehension

According to DIER (Y.-S. Kim, 2020a, 2020b, 2023), morphological awareness is related with vocabulary and word reading, which, in turn, are related to reading comprehension. In other words, morphological awareness is associated with reading comprehension (e.g., Carlisle, 2000; Goodwin & Ahn, 2010, 2013; Lee et al., 2022; Nagy et al., 2003; Tighe & Schatschneider, 2016), but this relation is primarily through vocabulary and word reading, which are related to reading comprehension. The ability to identify morphemes can facilitate inferring meanings of unfamiliar words (Goodwin et al., 2010, 2013; Kuo & Anderson, 2006; Nagy et al., 2006). English contains a wide array of Greek and Latin root words, and because these morphemes are widely used in academic vocabulary in English (Crosson & McKeown, 2016;

Crosson et al., 2019; Koda, 2007; Nagy et al., 2006), advanced morphological awareness is likely to contribute to a proficient vocabulary skill (Kuo & Anderson, 2006; Nagy et al., 2006; Reed, 2008). Meta-analyses and empirical studies have found overall moderate and positive associations of morphological awareness with vocabulary (e.g., Goodwin & Ahn, 2010, 2013; Lee et al., 2022; Tighe & Schatschneider, 2016), and similar results were found for L2 learners (e.g., Gellert & Arnbak, 2020; Kieffer & Box, 2013; Ramirez et al., 2010).

Morphological awareness is also important to word reading alongside phonological awareness and orthographic awareness (see the Triangle Model; Adams, 1990). English employs the morphophonological writing system—the language whose spellings follow both the principles of phonological and morphological information (Nagy et al., 2006). Therefore, word reading is influenced by one's ability to process morphemes in words in English (Y.-S. Kim, 2020b; Levesque et al., 2017, 2019). Studies have reported moderate and positive relation of morphological awareness with word reading (e.g., Goodwin & Ahn, 2010, 2013; Lee et al., 2022; Nagy et al., 2003), including findings from L2 speakers (e.g., Gottardo et al., 2017; Kieffer & Lesaux, 2008; Ramirez et al., 2010).

Processing of Multimorphemic Words

What is the underlying mechanism for the relations of morphological awareness to word reading and vocabulary? According to the Morphological Pathways Framework (Levesque et al., 2021; also see Levesque et al., 2017), *morphological decoding* supports morpho-orthographic segmentation and *morphological analysis* supports morpho-semantic segmentation. When reading a multimorphemic word, morphological decoding allows one to decompose the word, which facilitates their reading of the whole word. This is followed by morphological analysis—the process during which one defines the meaning of each morpheme decomposed in the

morphological decoding phase and combines them to integrate their meanings. In other words, morphological decoding involves orthographic processing of constituent units of words whereas morphological analysis involves semantic processing in which one draws on their combinatorial ability of the meaning of each morpheme. To illustrate, one's morphological awareness will enable one to decompose the word "unpredictable" by identifying the constituent morphemes *un-*, *pre-*, *dict*, and *-able*. Through the morphological decoding, they recognize and pronounce each morpheme. Through morphological analysis, they comprehend the meaning of each of them; "un- (negation prefix)," "pre- (before)," "dict (speak)," and "-able (possible)," and combine their meanings and generate and infer the meaning, "not possible to speak of something before occurrence."

A few studies explored how morphological decoding and morphological analysis, in addition to morphological awareness, are associated with language and literacy skills. McCutchen and Logan (2011) found that morphological analysis predicted vocabulary and reading comprehension over and above morphological awareness, phonological awareness, and word reading for English-speaking students in Grades 5 and 8. Levesque and colleagues (2019) found that morphological analysis predicted reading comprehension over and above morphological awareness, phonological awareness, vocabulary, word reading, and nonverbal ability for English-speaking Grades 3 and 4 students. Specifically, they found the students' morphological analysis, but not morphological awareness, in Grade 3 predicted their reading comprehension in Grade 4. Particularly informative and relevant to the present study is Leveque and colleagues' (2017) work with English-speaking children in Grade 3. In this study, morphological awareness predicted morphological decoding, morphological analysis, and vocabulary; and morphological awareness was indirectly related to word reading via

morphological decoding. In addition, word reading and morphological analysis, in turn, predicted reading comprehension, while morphological awareness was also directly related to reading comprehension over and above morphological decoding, morphological analysis, word reading, and vocabulary (as well as control variables, phonological awareness and nonverbal skill). In other words, morphological awareness was related to reading comprehension directly and also indirectly via morphological decoding and word reading, and via morphological analysis. Interestingly, vocabulary did not act as a mediator for the relation of morphological awareness and reading comprehension after accounting for morphological analysis, morphological decoding, and word reading.

Although informative, the results from previous studies (e.g., Deacon et al., 2017; Levesque et al., 2017, 2019; McCutchen & Logan, 2011) are mixed as described above. Furthermore, all these previous studies have been conducted with English-speaking students, and therefore, their generalizability is limited to English-speaking students. In the present study, I examined the relations among morphological awareness, morphological analysis, vocabulary, word reading, and reading comprehension, using data from Korean-speaking adolescents learning to read in English. This study will contribute to our understanding of the mechanisms through which morphological awareness contributes to reading comprehension as I tested the theoretical model on morphological processing (see Levesque et al., 2021) on Korean EFL middle school students—a population for whom this study has not been conducted. This would be informative for EFL teachers and curriculum developers because my findings would shed light on the role of morphological skill in reading comprehension.

Hypotheses

Based on the Morphological Pathways Framework (Levesque et al., 2021) and previous

studies (e.g., Deacon et al., 2017; Levesque et al., 2017, 2019; McCutchen & Logan, 2011), I hypothesized that morphological analysis would partially mediate the relation of morphological awareness with vocabulary and reading comprehension as morphological analysis facilitates semantic processing of the morphemes that constitute complex words. I did not hypothesize that morphological analysis would mediate the relation of morphological awareness to word reading as word reading is a morpho-orthographic skill, not semantic processing of morphemes (Levesque et al., 2021; Perfetti & Stafura, 2014).

Methodology

Participants

The information of the participants in this study is same as that of Study 1 and 2.

Measures

Morphological Awareness

The description of morphological awareness in English is on the Measures section of Study 2.

Morphological Analysis

To assess students' ability to analyze multimorphemic words in English with morphological clues, dynamic morphological awareness in Gellert and Arnbak (2020) was adapted. Because this was a Danish study and morphological principles of Danish and English are not comparable (Gellert & Arnbak, 2020), I developed the list of words that cover diverse prefixes, suffixes, and word roots in English using two Korean Grade 7 English textbooks as references. There were 10 real words and 10 pseudowords, which were randomly ordered. Two example items, one real word (daylight) and one pseudoword (wifeless), were provided as practice items. For each item, the students were asked whether they have heard or seen the word

and whether they knew the meaning of the word. They were also asked to define the word and explain how they figured out the meaning of each word. For example, for the practice item "daylight," the students were to write the meaning of the word in Korean (light shining during daytime), and then explain how they figured out the meaning (The word daylight is composed of "day" and "light," so it should mean the light that shines during the daytime.). Each item was scored in three aspects. First, if the students successfully identified constituent morphemes of the given word (e.g., day + light), they received 1 point per morpheme. Second, if the students defined each morpheme correctly, they received 1 point per morpheme. Third, if the student precisely combined the meaning of each morpheme they defined, they received 1 point per morpheme. Since the focus of the third aspect was on students' ability to combine morphemes and deduce meaning accordingly, they were not penalized for wrong definition of morphemes in the second part as long as they combined the meanings they had defined. To this end, an item with two morphemes was worth the total of 6 points and an item with three morphemes was worth the total of 9 points; Therefore, the total maximum score across all the test items was 135 points. The inter-rater reliability (exact agreement) was 95%. Cronbach's alpha was .95.

Vocabulary

The description of vocabulary in English is on the Measures section of Study 2.

Word Reading

The description of word reading in English is on the Measures section of Study 2.

Reading Comprehension

The description of reading comprehension in English is on the Measures section of Study 2.

Procedure

The procedure of this study was equal to that of Study 1 and 2. Morphological analysis assessment took place after English morphological awareness and before Korean reading comprehension.

Data Analysis

I used CFA and SEM using MPlus version 8 (Muthén & Muthén, 1998–2012) to answer my research questions. A latent variable was created for morphological awareness based on the three indicator variables: inflectional, derivational, and compound morphological awareness. Morphological analysis, word reading, vocabulary, and reading comprehension were observed variables measured by a single measure respectively. I first fitted a preliminary model that examined the relation among vocabulary, word reading, and reading comprehension without adding morphological awareness and morphological analysis to establish their relations (i.e., vocabulary and word reading predict reading comprehension; Model 1 in Figure 7). I fitted two additional preliminary models that explored the relation of vocabulary, word reading, and reading comprehension with morphological awareness (Models 2 and 3 in Figure 7).

To address my research questions, I fitted five alternative models where morphological analysis was added to explain the relation of morphological awareness, vocabulary, word reading, and reading comprehension (Models 4–8 in Figure 7). Model 4 hypothesized that morphological analysis is a complete mediator of the relation of morphological awareness to vocabulary, word reading, and reading comprehension. Model 5 hypothesized that morphological analysis is a partial mediator such that morphological awareness was hypothesized to be related to vocabulary and word reading over and above morphological analysis. Model 6 added a direct path from morphological awareness to reading comprehension to Model 5. Model 7 hypothesized morphological analysis to be a partial mediator via vocabulary. Model 8

hypothesized morphological analysis to be a partial mediator via vocabulary and word reading. Model fit comparisons were conducted by nBIC difference for non-nested models (Model 4 and Model 5) using the guidelines by Raftery (1995) and Sartorra-Bentler Scaled $\Delta\chi 2$ test for nested models (Models 5–8; see Table 4).

I used MLR as the estimator because compound morphological awareness had a kurtosis value greater than 7, and evaluated the model fit based on the same criteria as I did in Study 1.

Results

Descriptive Statistics and Preliminary Analysis

Missing data ranges ranged from 0% in word reading to 8% in morphological analysis, and Little's test of data MCAR was rejected ($\chi 2$ = 47.66, df = 27, p = .01). Table 1 shows descriptive statistics of the participants' means, standard deviations, score ranges, skewness, and kurtosis for each assessment. All skewness values within +/-3 and most of kurtosis values within +/-7 indicate that distributional properties of the variables are mostly appropriate for our analyses (West et al., 1995). An exception was the compound morphological awareness task, which had the kurtosis of 12.11 which is mainly due to the ceiling effect. For this reason, I used MLR as the estimator. Bivariate correlations among the variables are in Table 2. All variables used for Study 3 were statistically significantly related with coefficients ranging from .26 to .82.

The Relations Among Morphological Awareness, Morphological Analysis, Vocabulary, Word Reading, and Reading Comprehension

I first looked at the relations among vocabulary, word reading, and reading comprehension without morphological awareness and morphological analysis (see Model 1 of Figure 7). This model indicated that both vocabulary (.44, $p < .001$) and word reading (.44, $p < .001$) predicted reading comprehension; this relation remained after morphological awareness

was added to the model with an indirect relation to reading comprehension (Model 2 of Figure 7). When a direct relation to reading comprehension was added (see Model 3 of Figure 7), both vocabulary (p = .40) and word reading (p = .86) were no longer related to reading comprehension. Morphological awareness was related to vocabulary (.89, p < .001), word reading (.90, p < .001), and reading comprehension (.78, p < .001).

I then fitted five alternative models. Models 4–8, which included morphological analysis. Table 4 shows model fit information and model fit comparisons. Model 5 had a significantly better fit than Model 4 (see nBIC value comparison), and Model 6 significantly improved the model fit of Model 5. Neither Model 7 nor Model 8 significantly improved the model fit compared to Model 6. Thus, Model 6 was selected as the final model.

Standardized coefficients of Model 6 are presented in Figure 8. Morphological awareness was related to morphological analysis (.88, p < .001), vocabulary (.89, p < .001), word reading (.90, p < .001), and reading comprehension (.54, p = .047). Morphological analysis was moderately related to reading comprehension (.34) although the p-value was just over the .05 conventional significance level (p = .06) over and above morphological awareness, vocabulary, and word reading. Neither vocabulary (p = .57) nor word reading (p = .82) was related to reading comprehension holding morphological awareness and morphological analysis constant.

Discussion

I examined the nature of relations among morphological awareness, morphological analysis, vocabulary, word reading, and reading comprehension using data from 121 Korean-speaking EFL adolescents. Overall, morphological awareness was related to morphological analysis, word reading, vocabulary, and reading comprehension. These findings are in line with theoretical models such as Morphological Pathways Framework (Levesque et al., 2021), DIER

(Y.-S., Kim, 2020a, 2020b, 2023), and previous empirical findings (e.g., Deacon et al., 2017; Kieffer & Lesaux, 2008; Levesque et al., 2017, 2019; McBride-Chang et al., 2008; McCutchen & Logan, 2011). The results suggest that Korean EFL Grade 7 students' morphological awareness is important to their morphological analysis, vocabulary, word reading, and reading comprehension in English.

Importantly, I found that morphological analysis partially mediated the relation between morphological awareness and reading comprehension. This finding is in sync with the theory Morphological Pathways Framework (Levesque et al., 2021) and empirical findings (Levesque et al., 2017, 2019). That is, morphological awareness is related to reading comprehension partially through semantic analysis of morphemes. However, note that previous studies showed mixed findings. For example, Levesque and colleagues (2017) found that morphological awareness was directly related to reading comprehension over and above morphological analysis, vocabulary, and word reading for English-speaking third graders. On the other hand, Levesque and colleagues (2019) found from a longitudinal study from Grade 3 to Grade 4 that morphological awareness in Grade 3 did not predict reading comprehension in Grade 4 over and above morphological analysis. Instead, morphological analysis alone made a contribution to the reading comprehension controlling for phonological awareness, vocabulary, word reading, and nonverbal skills. Furthermore, Deacon and colleagues (2017) found that both morphological awareness and morphological analysis made unique contributions to reading comprehension controlling for phonological awareness, word reading, and nonverbal ability. These discrepant findings suggest a need for more empirical evidence on the role of morphological analysis in explaining the relation of morphological awareness to language and reading skills.

Not surprisingly, vocabulary and word reading predicted reading comprehension, which

is convergent with theoretical models and evidence (Deacon et al., 2017; Kieffer & Box, 2013; Y.-S., Kim, 2020a, 2020b, 2023; Nagy et al., 2003; Perfetti & Stafura, 2014). However, interestingly when morphological awareness and morphological analysis were added to the model, both vocabulary and word reading were no longer related to reading comprehension. This finding is divergent McCutchen and Logan (2011)'s finding in which vocabulary mediated the relation of morphological analysis to reading comprehension for Grades K-8 English speakers. One of the potential reasons for discrepant findings might be different contexts. McCutchen and Logan's (2011) study was conducted with English speakers whereas the current study was with EFL students in South Korea. My participants' knowledge of vocabulary words in English was more limited than English native speakers, given that my participants learn English as a foreign language, and this might have played a role. In other words, a certain level of vocabulary knowledge might be required for vocabulary knowledge to mediate the relation of morphological awareness and morphological analysis to reading comprehension.

Another possible reason is differences in measurement. Morphological awareness was measured with greater precision using a latent variable of three subskills whereas the other skills were observed variables with a single task. The fact that morphological analysis, vocabulary, word reading, and reading comprehension were not assessed as precisely as morphological awareness may have influenced the current findings. This is particularly the case given multicollinearity—strong correlations of morphological analysis with vocabulary and word reading (rs $\geq$ .71), all of which were strongly related to reading comprehension (rs $\geq$ .79). These strong relations together with the greater precision of measurement of morphological awareness might have resulted in the lack of independent contributions of vocabulary and word reading to reading comprehension after accounting for morphological awareness and morphological

analysis. Future studies with precise measurement of all the included skills can shed light on this speculation.

Limitations and Future Directions

The findings of this study should be interpreted with the following limitations in mind. First, morphological awareness was the only latent variable whereas the other variables were observed variables with single tasks. Future studies are warranted, using multiple measures for morphological analysis, vocabulary, word reading, and reading comprehension and using latent variables for them to improve measurement precision. Moreover, according to the Morphological Pathways Framework (Levesque et al., 2021), morphological decoding and morphological analysis constitute the mechanisms of processing morphemes in complex words. Only morphological analysis was included in the current study and morphological decoding was not. Future studies that include both morphological decoding and morphological analysis are needed.

My findings illustrate the role of morphological analysis in explaining how morphological awareness is associated with vocabulary, word reading, and reading comprehension. Although I cannot make a causal claim with my correlational findings, the positive relation of morphological awareness to reading comprehension via morphological analysis is worth noting both for theoretical and practical implications. My study is in line with existing theories (e.g., DIER; Y.-S. Kim, 2020a, 2020b, 2023; The Morphological Pathways Framework; Levesque et al., 2021) as I empirically found that morphological analysis is a pathway through which morphological awareness contributes to reading comprehension in English for Korean EFL learners. Practically, my study indicates instruction on morphological analysis might benefit Korean adolescents learning to read in English, because the findings illustrate that morphological analysis functions as a pathway through which their morphological

awareness in English supports reading comprehension of English texts. Future studies that investigate the effect of morphological awareness on language and literacy skills are warranted.

CHATPER 5: General Discussion

In my dissertation, I have explored the direct and indirect relations of morphological awareness, vocabulary, word reading, and reading comprehension for Korean EFL middle school students in their Korean (L1) and English (L2). I have selected DIER (Y.-S. Kim, 2020a, 2020b, 2023) as the main theoretical framework on which all my three studies are grounded on because this model best illustrates the direct and indirect relations of language and reading skills including all my skills of interest compared to other existing models on reading development. Taking an additional step forward, I examined the aforementioned relations across Korean and English as well based on Linguistic Interdependence Hypothesis (Cummins, 1979, 1991, 2005) as the theoretical model on cross-linguistic associations. In addition, I have examined the role of morphological analysis in explaining the association of morphological awareness to vocabulary, word reading, and reading comprehension in the students' English as morphological analysis is one of the morphological processing mechanisms through which morphological awareness contributes to the higher-order language and literacy skills (Levesque et al., 2017, 2019, 2021).

From Study 1, I found morphological awareness had a direct contribution to vocabulary, word reading, and reading comprehension for Korean-speaking Grade 7 students' reading comprehension in Korean. This finding is in line with what is found from the literature, from meta-analyses (e.g., Bowers et al., 2010; Lee et al., 2022; Tighe & Schatschneider, 2016) and empirical findings (e.g., Carlisle, 2000; Casalis & Colé, 2009; Deacon et al., 2014) including the findings from Korean speakers of the language (e.g., Bae & Joshi, 2017; Y.-S. Kim, 2010, 2011). Word reading mediated the relation of morphological awareness to reading comprehension, which is in line with DIER (Y.-S. Kim, 2020a, 2020b, 2023). Vocabulary, on the other hand, did not mediate the relation of morphological awareness to reading comprehension as opposed to

what DIER portrayed. A possible explanation of vocabulary not mediating the relation of morphological awareness to reading comprehension for Korean Grade 7 students may be due to the nature of measurement. The vocabulary measure I used did not have many multimorphemic words. If the vocabulary measure had many words that were composed of multiple morphemes, vocabulary may have been a mediator.

After looking into the Korean-speaking middle school students' language and reading development in Korean (L1), I further aimed to examine the abovementioned relations in their English (L2). In this regard, I explored in Study 2 not just the direct and indirect relations of morphological awareness with language and reading skills within each language, but across both languages as well. I first tested the dimensionality of morphological awareness by the languages—Korean (L1) and English (L2)—and three types of morphological awareness—inflectional, derivational, and compound morphological awareness. From factor analyses, I found that morphological awareness was multidimensional by language—morphological awareness in Korean and English. I believe this finding can be explained by my participants' differential development stages of Korean and English as they were in their intermediate stage of Korean development whereas their proficiency in English is rudimentary at best.

Across Korean and English; morphological awareness, word reading, and reading comprehension had a positive cross-linguistic association between each language of the students. This is in alignment with the Linguistic Interdependence hypothesis (Cummins, 1979, 1991, 2005) and Transfer Facilitation Model (Koda, 2005, 2007) that informed one's language and reading skills in L1 are positively related with the corresponding skills in L2, and thus one's development in L1 linguistic skills may facilitate those in L2. In other words, general underlying language skills such as phonological awareness, orthographic awareness, and semantic (or

morphological) awareness (Adams, 1990; Gombert, 1992) of the students who participated in my studies may have supported their processing of English with their ability to process Korean. Furthermore, their morphological awareness in Korean predicted reading comprehension in English via two pathways: through reading comprehension in Korean and morphological awareness in English. Having a comprehensive view on DIER (Y.-S. Kim, 2020a, 2020b, 2023) and the Linguistic Interdependence hypothesis (Cummins, 1979, 1991, 2005), these results make sense. First, their morphological awareness predicted reading comprehension in Korean. This is likely because morphological awareness helped process complex words that constituted the written text (Goodwin & Ahn, 2010, 2013; Lee et al., 2022) within Korean. This, in turn, may have helped reading comprehension in English, as some reading comprehension skills such as inference making and text organization might have been shared across reading in different languages. In my participants' case, their aforementioned reading comprehension skills in Korean may have been useful to their reading comprehension in English. Second, their morphological awareness in Korean predicted that in English as morphological awareness is one of the common underlying linguistic skills that were transferrable across languages (Gombert, 1992; Koda, 2007), and this may have been facilitated more by the similar morphological characteristics of Korean (Sohn, 1999) and English (Kuo & Anderson, 2006; Nagy et al., 2006). English morphological awareness, in turn, could predict English reading comprehension with the same process as their relations in Korean. In English, both vocabulary and word reading did not mediate the relation of morphological awareness to reading comprehension. This is likely due to the low English language proficiency level of our participants in that their vocabulary size was yet rudimentary at best. In the same vein, word reading may not have mediated the aforementioned relation because in Grade 7, Korean students were not systematically taught in

English decoding (i.e., phonics)—they are taught using a whole-word instructional approach. For participants with higher English proficiency level such as English L1 speakers or EFL students in higher-grade level who have more advanced vocabulary and word reading skills, vocabulary and word reading may mediate the relation of morphological awareness to reading comprehension in English.

Even though Study 1 and Study 2 have comprehensively explored both within and cross-linguistic associations of morphological awareness, vocabulary, word reading, and reading comprehension between students' L1 and L2; both of them have not explored mechanisms underlying these associations. To illustrate, Morphological Pathways Framework (Levesque et al., 2021) delved into the processing mechanisms of morphological awareness in its contribution to reading comprehension. In Study 3, I aimed to empirically test this framework to Korean-speaking middle school students who were beginner EFL learners. I added morphological analysis to examine what role it plays in explaining the direct and indirect relations of morphological awareness, vocabulary, word reading, and reading comprehension in English. I found that morphological analysis partially mediated the relation of morphological awareness to reading comprehension holding vocabulary and word reading constant. Surprisingly, morphological analysis neither mediated the relation of morphological awareness to vocabulary nor to word reading, which was hypothesized according to existing findings that involved morphological analysis (e.g., Deacon et al., 2017; Levesque et al., 2017, 2019; McCutchen & Logan, 2011). A potential reason behind this discrepant finding could be due to my participants' limited English word knowledge at their grade level. With more advanced vocabulary knowledge and decoding skills, which was the case from the abovementioned studies that had L1

participants, morphological analysis may have mediated the relation of morphological awareness to vocabulary and word reading, which, in turn, may have predicted reading comprehension.

In summary, my dissertation studies have examined direct and indirect relations of morphological awareness, vocabulary, word reading, and reading comprehension collectively for Korean middle school students. Specifically, these relations were explored not just within their Korean (L1) but across their Korean and English (L2) as well. Moreover, Korean middle school students' processing mechanism through which morphological awareness contributes to reading comprehension in English has been explored. Together, I believe findings of the three studies have broadened our understanding of this topic.

Overall Limitations and Future Directions

Overall, there are a few limitations that apply across three studies that make up my dissertation. First, Korean morphological awareness measures had overall lower-than-ideal internal consistency estimates. Even though I used a latent variable approach, the low internal consistency of these assessments is certainly a limitation. Second, both in Korean and English, morphological awareness was the only latent variable whereas the other skills were measured by single tasks. Future studies need to replicate the present study using multiple measures and latent variables for vocabulary, word reading, and reading comprehension. Third, due to the limited sample size, I could not test more complex CFA models that test the dimensionality of morphological awareness such as second-order or bifactor models. Future studies should replicate the current study with a larger sample. Fourth, according to the Morphological Pathways Framework (Levesque et al., 2021), morphological decoding and morphological analysis constitute the mechanisms of processing morphemes in complex words, but only morphological analysis was included in the current study. Future studies that include both

morphological decoding and morphological analysis are needed. Also regarding morphological analysis, I only measured this in English (L2) but not in Korean (L1), thus could not test the cross-linguistic association between this morphological processing mechanism. Future studies that explore morphological decoding and morphological analysis in both L1 and L2 would be informative in that it would provide scholars with information on the specific mechanisms through which morphological awareness is associated with language and reading skills both within and across L1 and L2.

CHAPTER 6: Conclusion

My dissertation studies explored the direct and indirect relations of morphological awareness to vocabulary, word reading, and reading comprehension within and across their Korean (L1) and English (L2) for Korean-speaking Grade 7 EFL students. In Study 1, I first examined this relation for the students' Korean, and found a positive relation of morphological awareness with vocabulary, word reading, and reading comprehension. Moreover, word reading partially mediated the relation of morphological awareness to reading comprehension. In Study 2, I explored the dimensionality of the students' morphological awareness by language (Korean and English) and type of morphological awareness (inflectional, derivational, and compound morphological awareness), and found the Grade 7 EFL students' morphological awareness was described by language. In addition, I found that the students' morphological awareness in Korean (L1) predicted reading comprehension in English (L2) through two pathways: through reading comprehension in Korean and morphological awareness in English. In Study 3, I examined whether morphological analysis explains the relation of morphological awareness to vocabulary, word reading, and reading comprehension in English, the students' L2. Morphological analysis was found to mediate the relation of morphological awareness to reading comprehension over and above vocabulary and word reading. This finding indicates that morphological analysis was a mechanism through which morphological awareness predicted reading comprehension in English for Korean adolescents in Grade 7, supplementing for their yet limited English vocabulary knowledge.

In the current globalized era (Collins & Ho, 2020; della Chiesa, 2012), it is imperative to develop an understanding of bilingual and biliteracy development due to the importance of becoming proficient in more than one language today and intricacy of the developmental nature

of language and reading skills across different languages. As seen from numerous theoretical models in reading development, reading is a complex skill that requires a number of language, literacy, and cognitive skills even within a single language (see DIER; Y.-S. Kim, 2020a, 2020b, 2023; the Reading Systems Framework; Perfetti & Stafura, 2014). In this regard, it would be meaningful to further explore the developmental nature of students' language and reading skills both within and across their L1 and L2. To this end, my dissertation studies have made the following unique contributions to the field: First, I explored the intricate relations of morphological awareness with language and reading skills in the context of Korean EFL adolescents. Whereas there have been a number of findings that examined how morphological awareness was related with these skills, my studies further explored the direct and indirect relations of these skills simultaneously. Second, the study included a population—adolescent EFL students—that has been insufficiently studied. The majority of previous studies were with either L1 speakers or only in L2 for students from language minority background. Third, cross-linguistic associations of language and reading skills between Korean and English have been seldom explored. Most of existing cross-linguistic findings examined the relations between English and Spanish due to their linguistic similarity (Lam & Sheng, 2016) and the ample size of these student population in the US. In contrast, there are comparatively small size of Korean-English bilingual students resulting in difficulty of accessing such student population, and likely not piquing scholars' interest as much as studying Spanish-English bilingual students. With that said, Korean and English have considerable similarities in terms of morphological features and developmental trajectories (Kuo & Anderson, 2006; Sohn, 1999) albeit their use of different alphabets, and thus the cross-linguistic relations between these two languages is worth exploring. Last but not least, I delved into a mechanism for the relation of morphological awareness to

reading comprehension by examining the role of morphological analysis. The findings shed light on a mechanism through which EFL students process multimorphemic words in L2.

Although I cannot make a causal claim with correlational findings, my dissertation studies have some pedagogical implications for both L1 and L2 language teachers. First, my findings throughout the three studies suggest morphological awareness can contribute to students' reading comprehension both in L1 and L2. These results suggest that explicit instruction on morphological awareness and morphological analysis has the potential to improve middle school students' reading comprehension both within their L1 and L2. Notwithstanding my study only explored the associations of morphological analysis in students' L2 but not L1, according to existing theories on reading development (e.g., DIER; Y.-S. Kim, 2020a, 2020b, 2023) and cross-linguistic association (e.g., Linguistic Interdependence Hypothesis; Cummins, 1979, 1991, 2005), our findings in L2 would also be applicable to the students' L1. Currently throughout Korean language curriculum in middle school, there is only one chapter in Grade 7 focusing on Korean morphology. Aside from that part of the curriculum, however, Korean language curriculum neither puts sufficient emphasis on developing students' morphological awareness and morphological analysis nor inform students of how to morphologically process unfamiliar words. To this end, it would be recommendable for Korean language curriculum to add more chapters that provide explicit instruction on widely used prefixes, suffixes, and root words in Korean, and train them intensively on how to identify those morphemes and manipulate them as needed. Considering Korean is a morphologically rich language all in terms of inflectional, derivational, and compound morphemes (Sohn, 1999), and thus one's advanced morphological awareness is likely to be helpful in learning vocabulary and reading (Bowers et al., 2010; Y.-S. Kim, 2020a, 2020b, 2023; Lee et al., 2022; Levesque et al., 2021; Perfetti &

Stafura, 2014) in Korean, I postulate devoting more time in morphological instructions would benefit middle school students' learning of language and reading skills in Korean. The same would be true for English language curriculum if not more, in which there is currently even less emphasis on understanding English morphology in middle school. From my findings in this dissertation studies, I firmly believe more emphasis should be given on students' ability to identify constituent morphemes of complex words and shift their forms appropriately by different grammatical and semantic contexts. Especially for students in lower grade level as were my participants in this dissertation studies whose vocabulary knowledge in English were yet underdeveloped, their ability to process morphemes that compose unfamiliar complex words is likely to play an integral role in learning and processing difficult words and texts in English. As a result, I assert there should be more explicit and intensive morphological instruction for Korean middle school students' English language curriculum from earlier on. Second, students' reading skills in L1 can aid their reading in L2. These findings suggest the importance of L1 development in learning L2. As a result, my findings inform language teachers that they should provide intensive instruction to students on examples of widely used morphemes, and how to recognize them from complex words; not just for the purpose of reading improvement in the language, but for reading improvement in foreign languages as well. As I have argued in the previous point, I believe devoting more lessons on Korean morphology and training students more systematically on how to process diverse morphemes making up Korean words would not only be helpful in becoming a proficient reader in Korean but also in different languages as English. In the same vein, I would recommend including more items that test students' knowledge of widely used morphemes, and ability to identify and manipulate them appropriately as needed in existing language assessments both in Korean and English (e.g., Korean College

Entrance Exam, national diagnostic tests in Korean and English language sections, school examinations) that are currently insufficiently asked. If language assessments underscore students' morphological awareness, it is likely for curriculum developers and teachers to accentuate morphological instruction in early middle school grade levels. I expect such pedagogical change in Korean and English language classes in Korea would contribute to students' learning of vocabulary, word reading, and reading comprehension both for their Korean and English.

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Table 1

Examples of Inflectional, Derivational, and Compound Morphemes in English and Korean

Type of Morpheme	English	Korean
Inflectional morpheme	*-(e)s/-ies*: Plural (flowers, puppies) *-(e)d/-ied*: Past tense (played, studied) *-'s*: Possessive (Tom's cat) *-er*: Comparative (smarter) *-est*: Superlative (tallest)	-들: Pluralization (꽃들, 사람들) *-의*: Possessive (영수의, 선생님의) -은/는/이/가: Nominal case particle (우리는, 선생님은, 학생이, 축구선수가) *-다*: Present tense informal (놀다, 예쁘다) *-ㅆ다*: Past tense informal (놀았다, 예뻤다) *-ㄹ 거다*: Future tense informal (놀거다, 예쁠거다) *-ㅏ/ㅓ 요*: Present tense semi-formal (놀아요, 예뻐요) *-ㅆ어요*: Past tense semi-formal (놀았어요, 울었어요) *-ㄹ 거에요*: Future tense semi-formal (놀거에요, 예쁠거에요) *-니다*: Present tense formal (놉니다, 예쁩니다) *-ㅆ습니다*: Past tense formal (놀았습니다, 울었습니다) *-ㄹ 겁니다*: Future tense formal (놀겁니다, 예쁠겁니다)
Derivational morpheme	*un-, dis-, il-, ig-, non-, mal-*: Negation (unable, illegal) *-ness, -ment, -t(s)ion*: Nominalization (government, vacation)	-ㄴ: Adjective (예쁜, 환한, 가벼운) -ㅁ: Nominalization (예쁨, 환함, 가벼움)

Type of Morpheme	English	Korean
	-*(l)y/-ily*: Adjective or adverb (quickly, easily) -*er*: Person or tool (teacher, computer) -*able*: Possible (usable) -*ful*: Be full of (helpful) -*less*: None or scarce (hopeless) *multi-*: Multiple/Many (multitasking) *sub-*: Under (subway, subcategory)	-*이*: Nominalization or adverb (깊이, 높이) *미-, 불-, 부-, 비-, 무-*: Negation (미성숙, 불가능, 무면허) -*화*: Transition (세계화) *신-*: New (신세계) *구-*: Old (구시대) *다-*: Multiple (다목적) *정-*: Exact (정사각형) *과-*: Excessive (과소비) -*가, -자, -수*: Person who does something (과학자, 발명가, 가수) -*장*: Person who is the chief at something (교장, 선장)
Compound morpheme	Noun + Noun = Compound Noun (basket + ball = basketball) Adjective + Adjective = Compound Adjective (light + yellow = light-yellow)	Noun + Noun = Compound Noun (쓰레기 + 통 = 쓰레기통) Adjective + Adjective = Compound Adjective (새 + 파랗다 = 새파랗다)

Table 2

Descriptive Statistics

Variable	Reliability	N	M	SD	Minimum	Maximum	Skewness	Kurtosis
Korean Measures								
Inflectional Morphological Awareness	.67	116	9.45	2.62	0	15	-0.75	3.77
Derivational Morphological Awareness	.58	116	9.22	2.19	0	13	-0.68	3.38
Compound Morphological Awareness	.61	116	12.90	1.97	0	15	-1.14	4.07
Vocabulary	.74	119	15.55	4.28	0	26	0.02	2.26
Word Reading	.94	121	82.77	12.56	0	192	-0.19	3.04
Reading comprehension	.87	116	25.70	7.29	0	35	-1.03	3.62
English Measures								
Inflectional Morphological Awareness	.93	119	9.24	4.70	0	15	-0.47	2.01
Derivational Morphological Awareness	.84	119	10.48	3.55	0	15	-0.94	3.04
Compound Morphological Awareness	.84	119	13.39	2.52	0	15	-2.73	12.11
Vocabulary	.81	119	19.27	5.01	0	30	-0.31	2.38
Word Reading	.98	121	48.49	20.00	0	104	-0.60	2.89
Reading comprehension	.93	119	25.34	13.11	0	53	-0.04	2.17
Morphological Analysis	.95	114	65.35	35.68	0	135	-0.27	2.12

Note. $N = 121$. All reliabilities measures except Korean word reading and English word reading were Cronbach's α. Reliability measure for Korean and English word reading was test-retest reliability.

Table 3

Bivariate Correlations among Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
Korean Measures													
1. Inflectional Morphological Awareness	--												
2. Derivational Morphological Awareness	.56***	--											
3. Compound Morphological Awareness	.51***	.45***	--										
4. Vocabulary	.42***	.39***	.35***	--									
5. Word Reading	.27***	.23***	.19*	.23*	--								
6. Reading comprehension	.55***	.49***	.50***	.46***	.40***	--							
English Measures													
7. Inflectional Morphological Awareness	.56***	.41***	.50***	.41***	.25**	.54***	--						
8. Derivational Morphological Awareness	.51***	.40***	.35***	.30***	.16	.49***	.80***	--					
9. Compound Morphological Awareness	.35***	.26***	.44***	.19*	.20*	.41***	.47***	.58***	--				
10. Vocabulary	.61***	.41***	.34***	.54***	.37***	.49***	.75***	.66***	.26**	--			
11. Word Reading	.53***	.39***	.30***	.39***	.44***	.48***	.80***	.68***	.31***	.82***	--		
12. Reading Comprehension	.63***	.50***	.49***	.52***	.42***	.64***	.78***	.67***	.36***	.79***	.79***	--	
13. Morphological Analysis	.61***	.50***	.47***	.43***	.33***	.63***	.71***	.67***	.38***	.73***	.71***	.80***	--

Note. $N = 121$.

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4

Model Fit Indices

a. **CFA Models for Study 2**

Model	*χ2 (df)*	*p*	RMSEA [90% CI]	CFI	TLI	SRMR	Model Comparison: S-B Scaled *Δχ2* (*Δdf*, *p*)
Model 1	44.08 (9)	< .001	.18 [.13, .24]	.87	.78	.08	
Model 2	28.42 (6)	< .001	.18 [.11, .24]	.92	.79	.06	Model 1 vs. Model 2: 15.74 (3, .001)
Model 3	21.37 (8)	.01	.12 [.06, .18]	.95	.91	.06	Model 2 vs. Model 3: 10.56 (2, .01)

Note. *df* = degree of freedom, RMSEA = root mean square error of approximation, CI = confidence interval, CFI = comparative fit index, TLI = Tucker-Lewis Index, SRMR = standardized root mean square residual, Sartorra-Bentler Scaled Δχ2 Test was used because compound morphological awareness had the kurtosis value above 7.

b. **Models for Study 3**

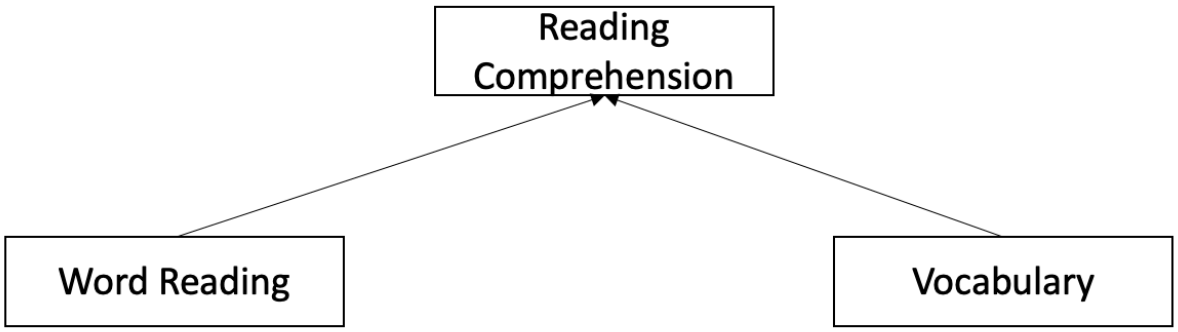
Model	*χ2 (df)*	*p*	RMSEA [90% CI]	CFI	TLI	SRMR	Model Comparison: S-B Scaled *Δχ2* (*Δdf*, *p*)
Preliminary Models							
Model 1	0 (0)	< .001	.00 [.00, .00]	1.00	1.00	.00	
Model 2	29.92 (8)	< .001	.15 [.10, .21]	.96	.92	.04	
Model 3	15.28 (7)	.03	.10 [.03, .17]	.98	.96	.03	
Alternative Models							
Model 4	94.08 (12)	< .001	.24 [.19, .28]	.87	.77	.07	
Model 5	22.29 (12)	.03	.08 [.02, .14]	.98	.97	.03	Model 4 (nBIC = 4856.99) vs. Model 5 (nBIC = 4782.61): ΔnBIC = 74.38
Model 6	17.22 (11)	.10	.07 [.00, .13]	.99	.98	.02	Model 5 vs. Model 6: 4.07 (1, .04)
Model 7	17.79 (10)	.06	.00 [.00, .14]	.99	.97	.02	Model 6 vs. Model 7: 0.06 (1, .81)
Model 8	17.10 (9)	.05	.09 [.01, .15]	.99	.97	.02	Model 6 vs. Model 8: 0.48 (2, .79)

Note. *df* = degree of freedom, RMSEA = root mean square error of approximation, CI = confidence interval, CFI = comparative fit index, TLI = Tucker-Lewis Index, SRMR = standardized root mean square residual. Sartorra-Bentler Scaled Δχ2 Test was used because compound morphological awareness had the kurtosis value above 7. The comparison of Model 4 vs. Model 5 was done by ΔnBIC test since these models were not nested to one another.

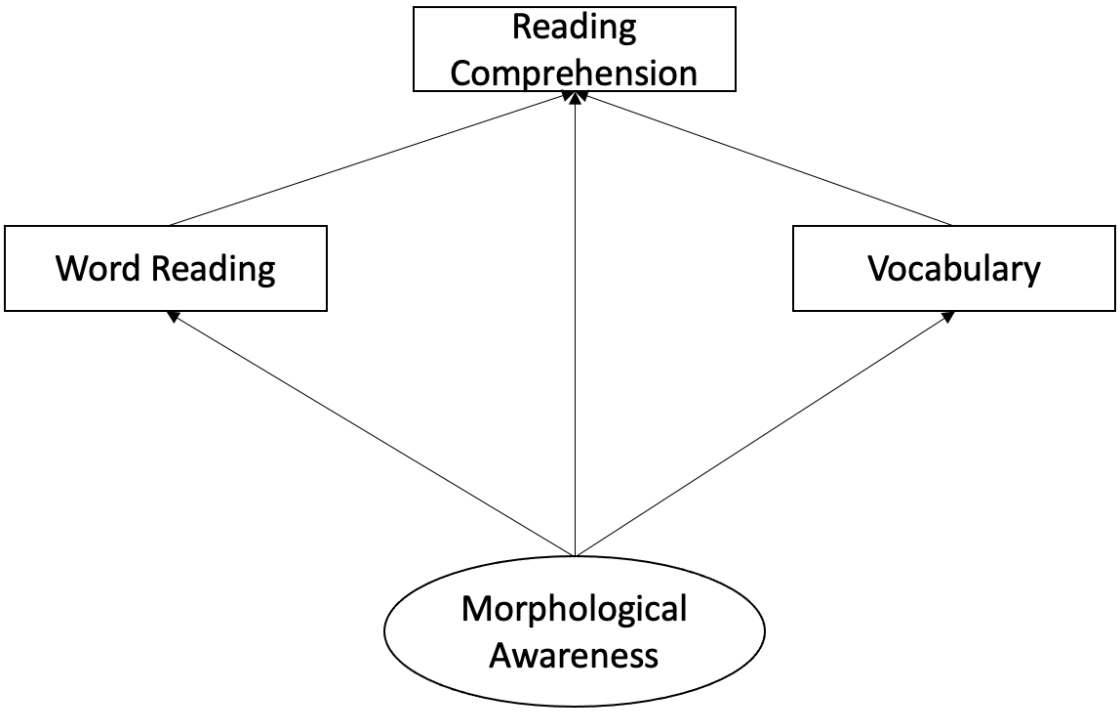
Figure 1

Alternative Models for the Relations among Morphological Awareness, Vocabulary, Word Reading, and Reading Comprehension for Study 1

a. **Model 1**



b. **Model 2**



c. **Model 3**

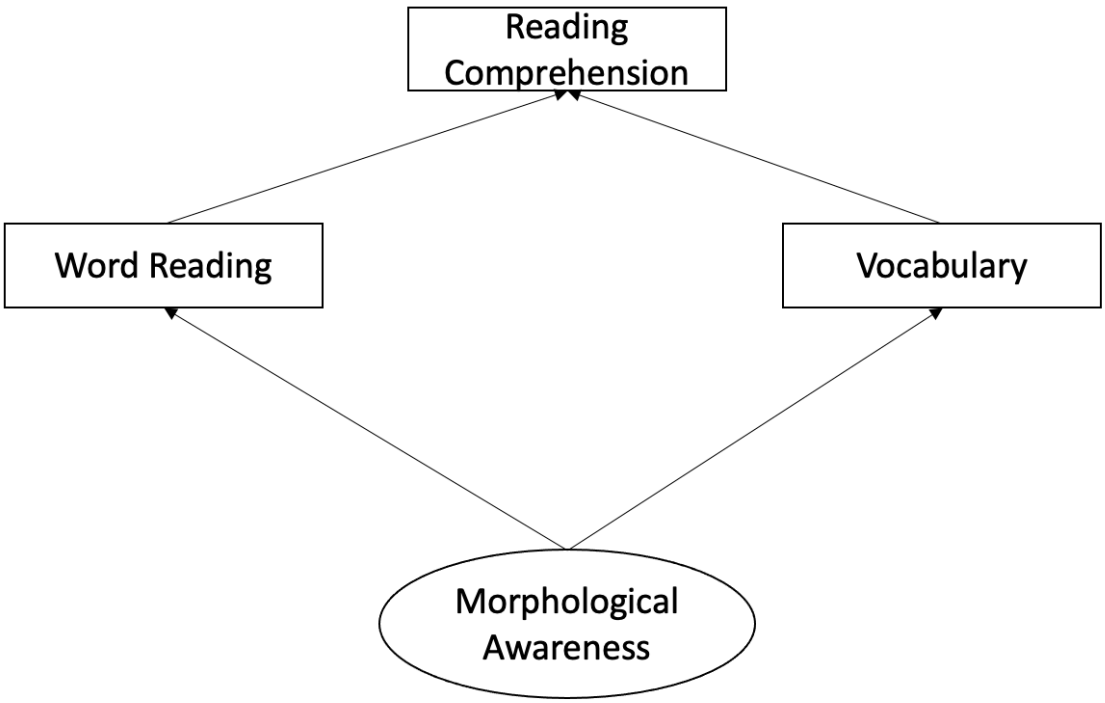
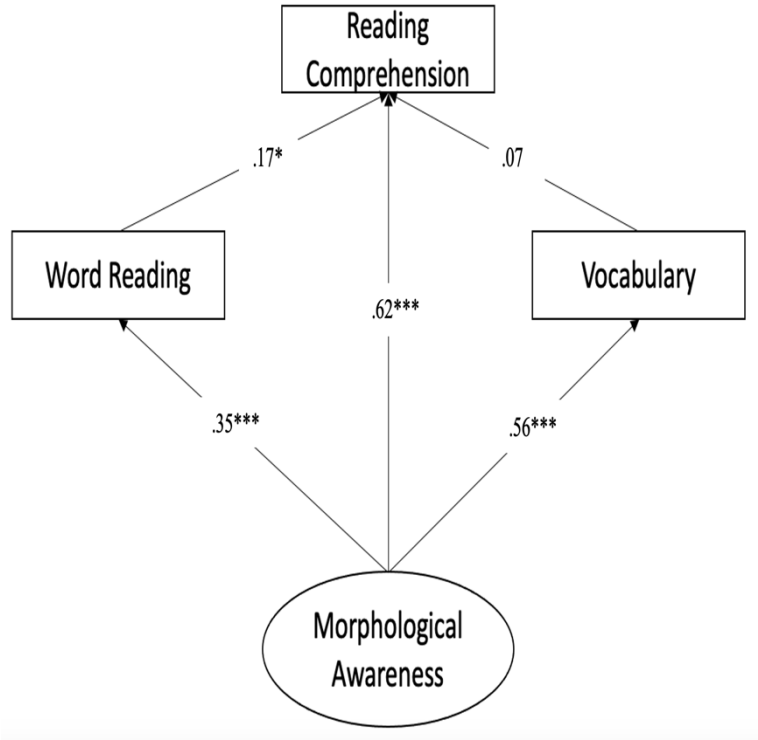

Reading Comprehension
Word Reading
Vocabulary
Morphological Awareness

Figure 2

Standardized Path Coefficients for the Relations among Morphological Awareness, Vocabulary, Word Reading, and Reading Comprehension for Korean Grade 7 Students for Study 1 (N = 121)

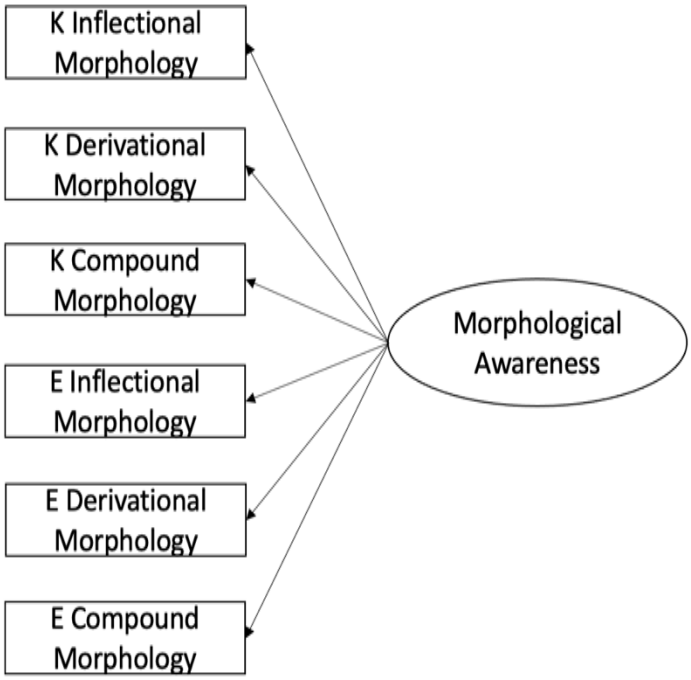


Note. *p < .05. **p < .01. ***p < .001.

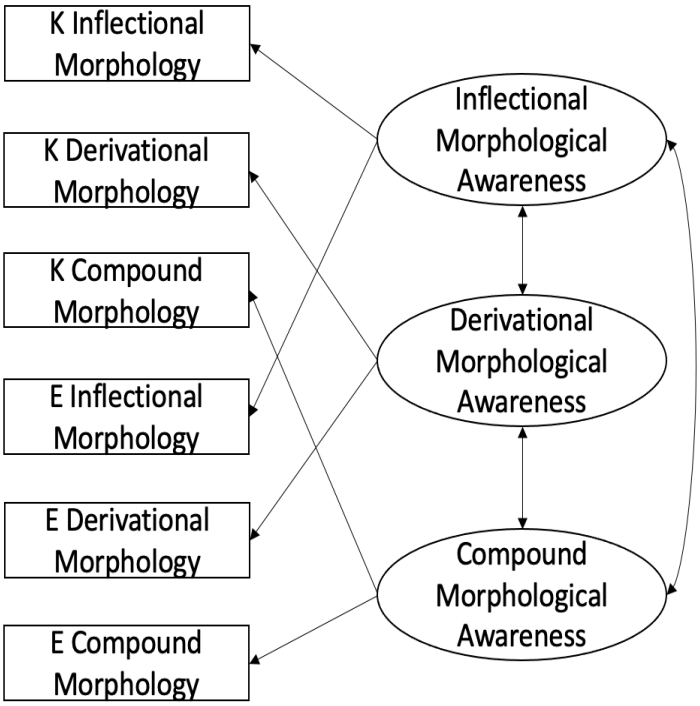
Figure 3

Alternative Factor Relations of Dimensionalities of Morphological Awareness for Study 2

a. CFA Model 1



b. CFA Model 2



c. CFA Model 3

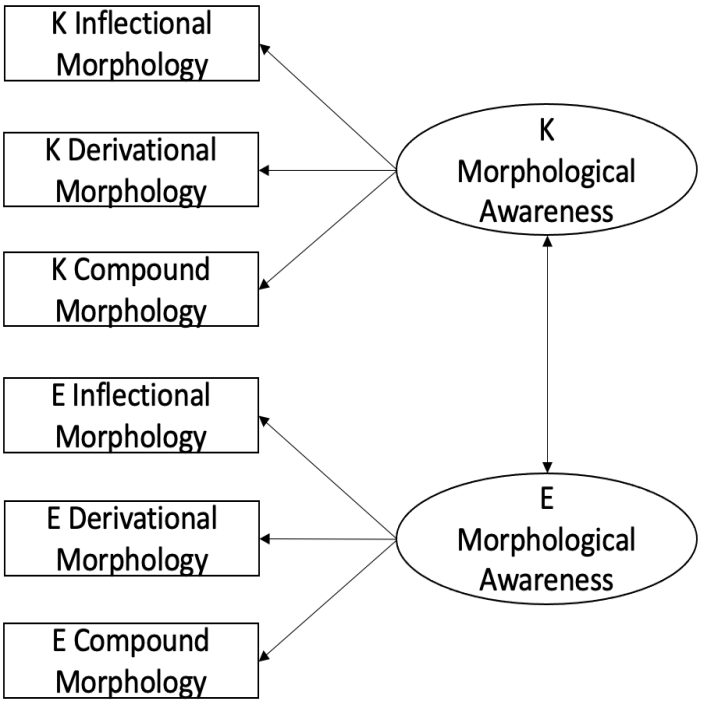


Figure 4

Structural Equation Model for the Relations among Morphological Awareness, Vocabulary, Word Reading, and Reading Comprehension across Korean and English for Study 2

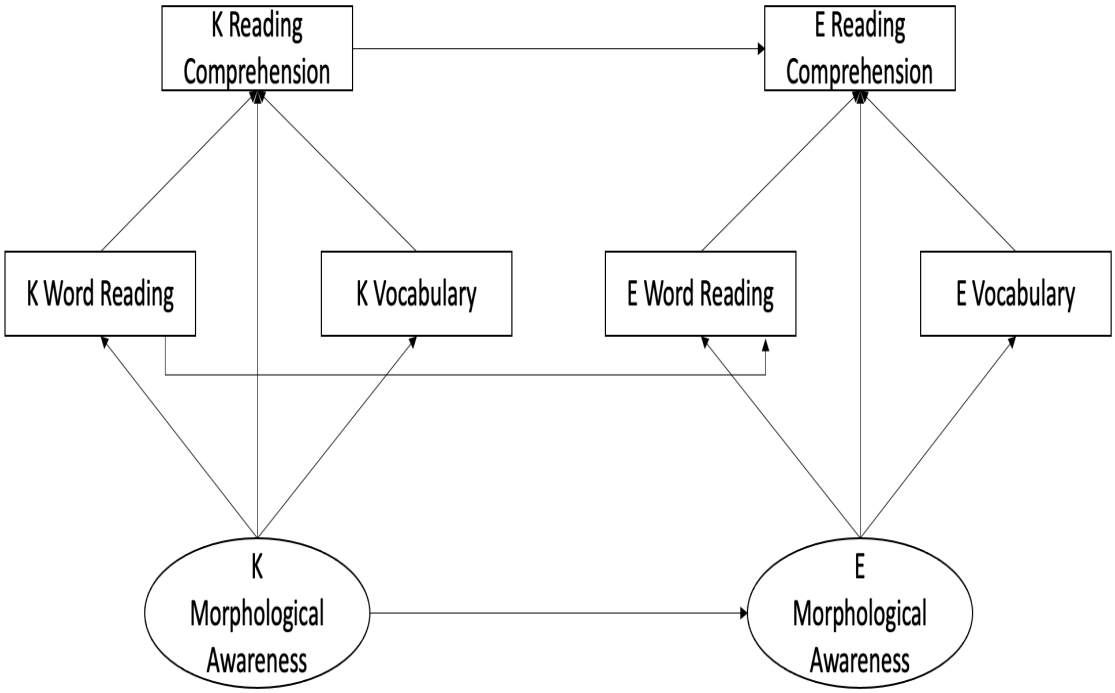
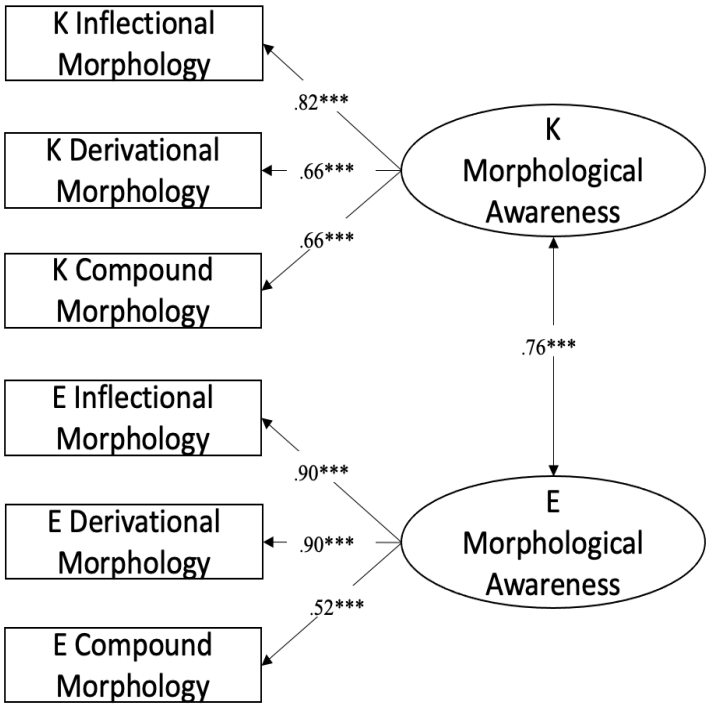


Figure 5

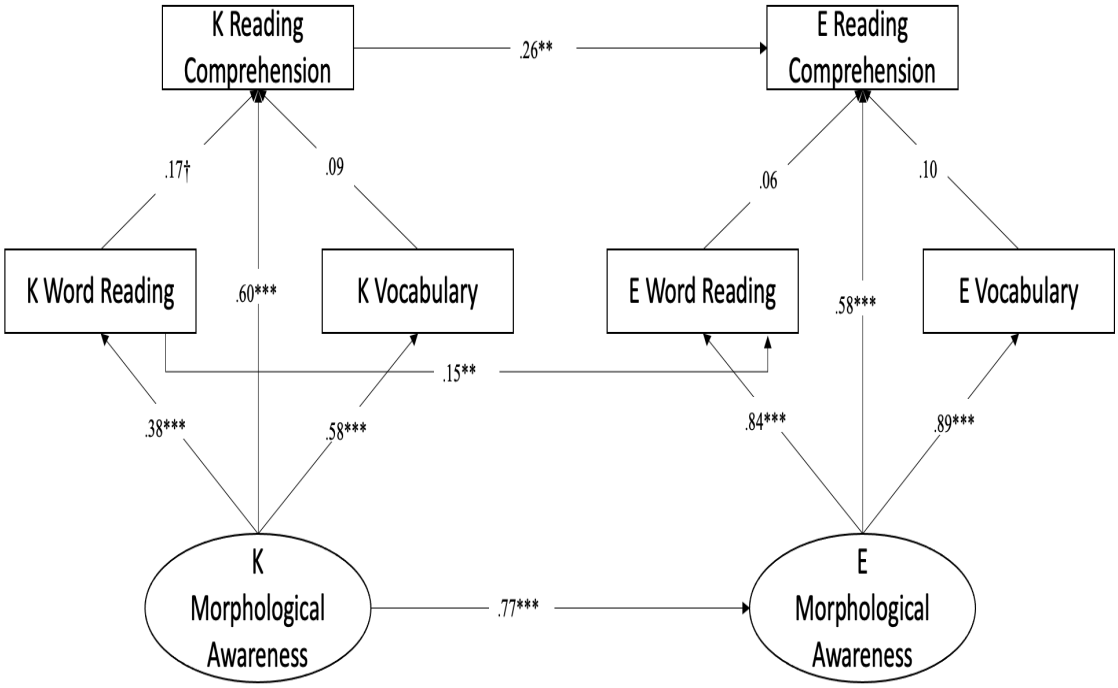
Standardized CFA Model for Multidimensionality of Morphological Awareness by Language for Study 2 ($N = 121$)



Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Figure 6

Standardized Path Coefficients for the Relations among Morphological Awareness, Vocabulary, Word Reading, and Reading Comprehension across Korean and English for Study 2 (N = 121)

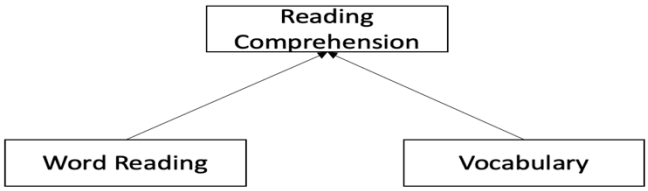


Note. *p < .05. **p < .01. ***p < .001.

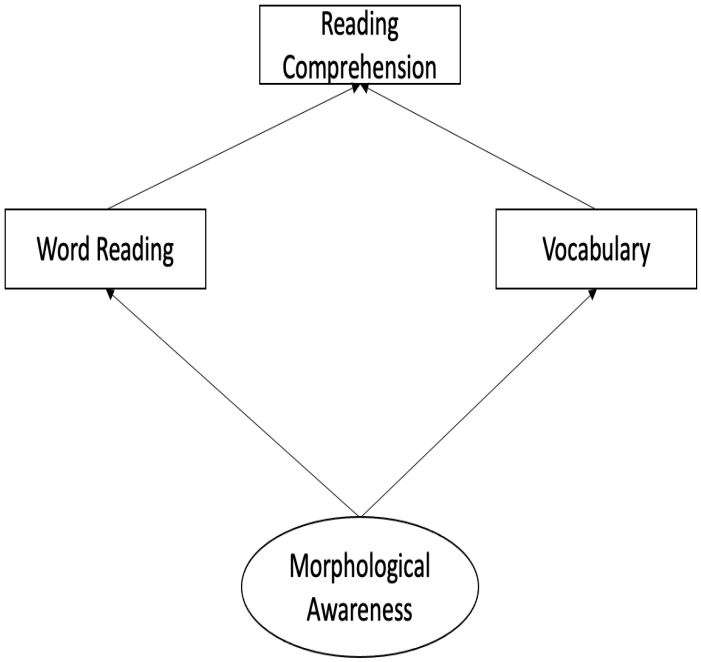
Figure 7

Alternative Models for the Relations among Morphological Awareness, Morphological Analysis, Vocabulary, Word Reading, and Reading Comprehension for Study 3 ($N = 121$)

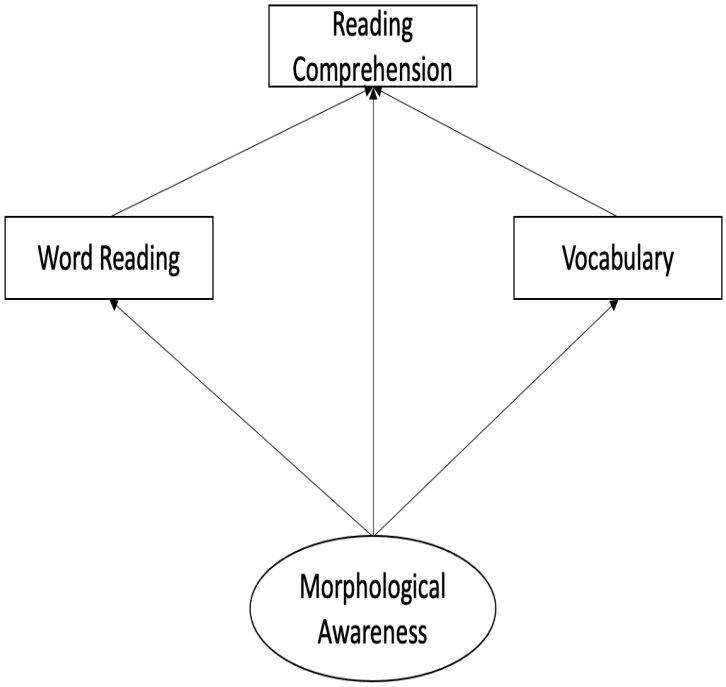
a. Model 1



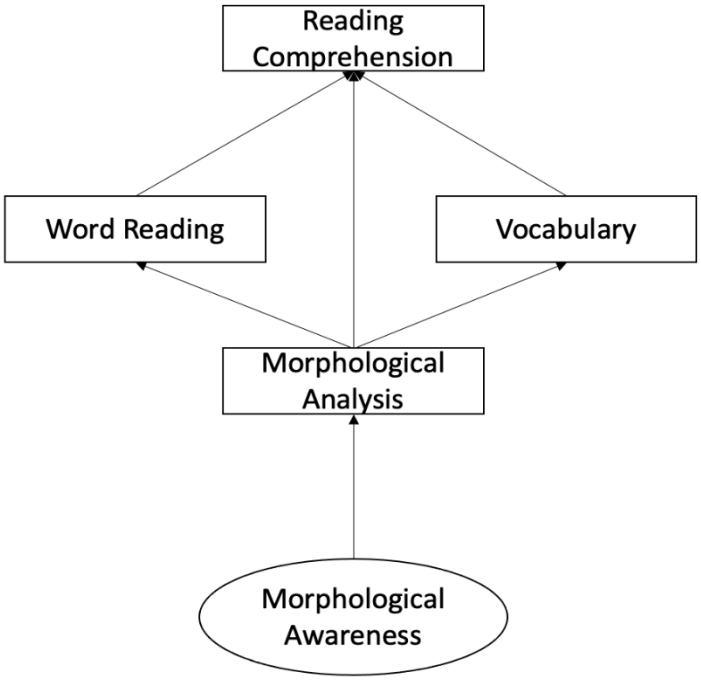
b. Model 2



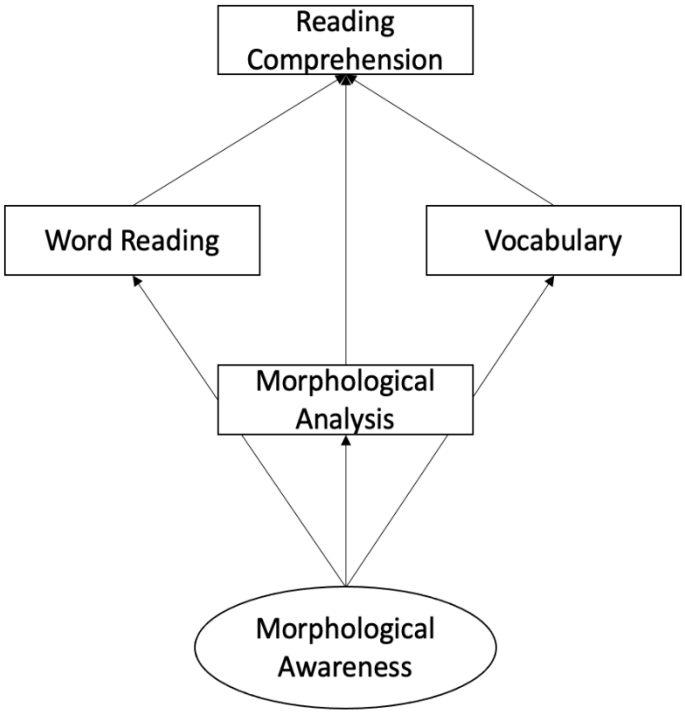
c. Model 3



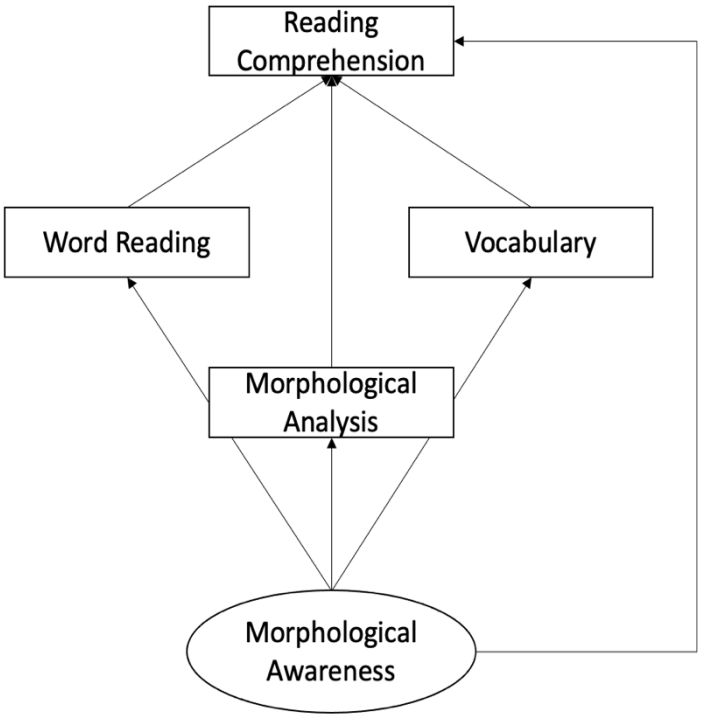
d. Model 4



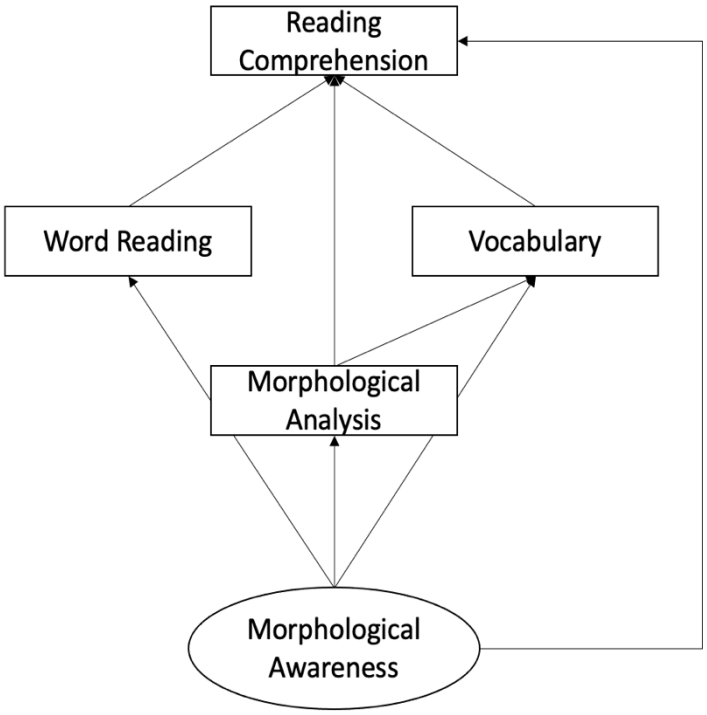
e. **Model 5**



f. Model 6



g. Model 7



h. Model 8

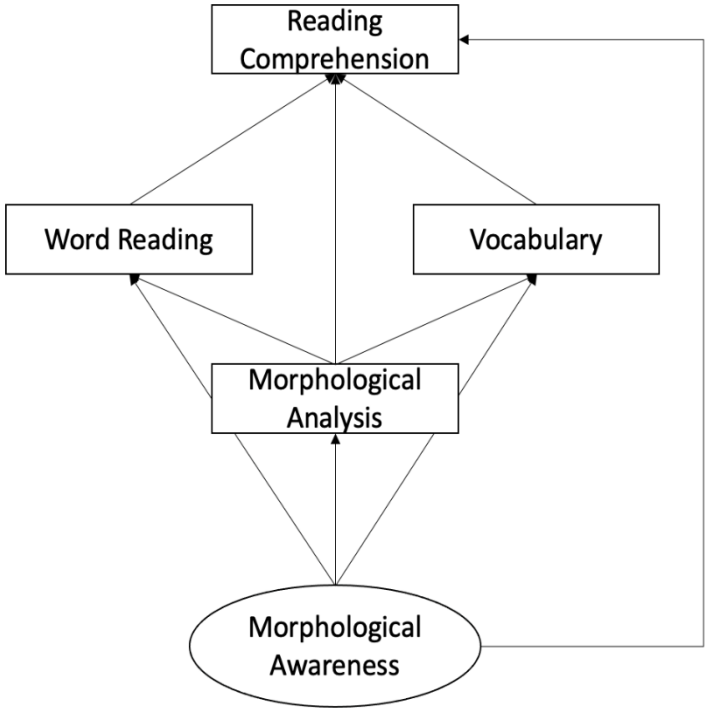
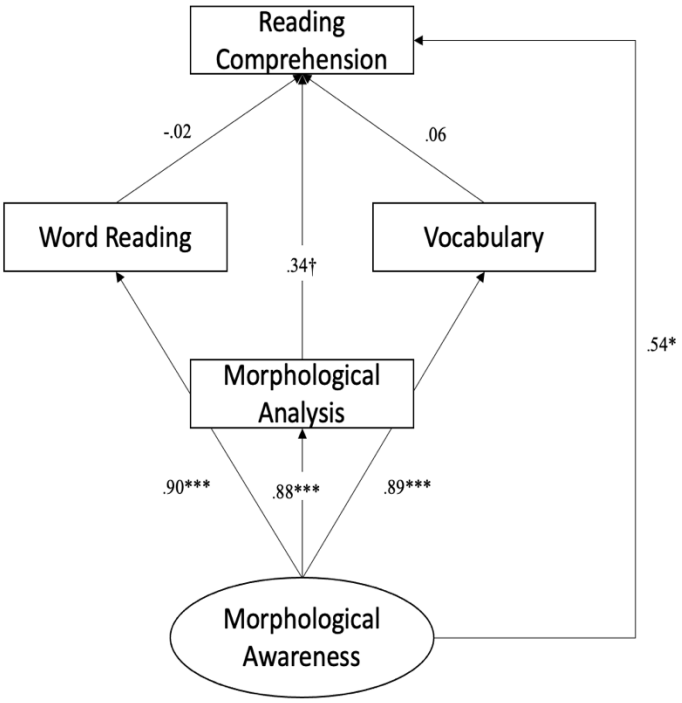


Figure 8

Standardized Path Coefficients for the Relations among Morphological Awareness, Morphological Analysis, Vocabulary, Word Reading, and Reading Comprehension for Study 3 (*N* = 121)



Note. †$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.