Chapter 6
Morphological Awareness and Reading Development in Bilingual English-Chinese Children in Singapore

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Introduction

Singapore adopted a quadrilingual education system in the 1970s, and this policy continues to be seen as essential for the country's economic development and cultural continuity (Dixon 2005; Pakir 2008; Silver and Bokhorst-Heng, this volume). Under this policy, all school children study all subjects (except the mother tongues and a moral education class) through the medium of English, and at the same time, they are required to be literate in a second language. This second language refers to the official mother tongue – Mandarin for Chinese, Malay for Malays, and Tamil for Indians. It should be noted that these three languages are designated as mother tongues for children based on their ethnicity and are often not their first language. In this chapter, we refer to Mandarin as 'mother tongue' for English-Chinese bilingual children in order to avoid confusion. We also argue that many Chinese families in recent decades have adopted Mandarin as their home language (Singapore Statistics 2010) partly because of the strong 'top-down' – Speak Mandarin Campaign – intervention and partly because Mandarin is required for school examinations and often is a sine qua non for obtaining a job. However, we also recognize the complex linguistic situation in Singapore where the national census states that either English or one of the four mother tongues is the dominant language in Singaporean homes, but recent research suggests otherwise. Aman et al. (2009) posit that bilingual practice is the norm for home environments: 7.4% of children use English as their dominant language at home, 70.9% of children use both

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English and mother tongue language, and 19.3% use mother tongue and/or other varieties.

Most of the bilingual research in Singapore has focused on the development of English and mother tongue languages in the context of classroom instruction (Goh 2003; Liu and Zhao 2008), curriculum development (Tan 2006; Curdt-Christiansen 2009), and sociolinguistic aspects of these languages (Bokhorst-Heng and Caleon 2009; Vaish 2007). Moreover, in these studies, English and mother tongue languages have been treated separately, and very little research has been conducted to explore the development of biliteracy in Singaporean bilingual children. In this study, we attempt to fill this gap by exploring the biliteracy development of these children and by identifying the underlying linguistic factors that may influence such development in a formal instructional context. Specifically, we examine: (1) two aspects of morphological awareness (derivational and compound) in both languages among Singaporean English-Chinese bilingual children, (2) their effects on the vocabulary and reading comprehension in these two languages, and (3) whether there is evidence of crosslinguistic morphological transfer.

Morphological awareness refers to the ability to reflect on and manipulate morphemes and to employ word formation rules in one's language (Kuo and Anderson 2006). Among the various linguistic factors that have been proposed to play a role in children's literacy development, phonological awareness has received considerable attention (for a review, see Goswami 2006). However, understanding the relationship between phonological forms and semantic information and recognizing more complex words based on their structural properties are also critical in achieving success in reading and literacy development (Carlisle 2010; Kuo and Anderson 2006). Therefore, in recent years, morphological awareness and its relationship to literacy development has received increasing attention. Converging evidence has shown that morphological awareness plays a significant role in learning to read alphabetic languages (Carlisle 1995; Carlisle and Fleming 2003; Deacon and Kirby 2004) as well as nonalphabetic languages, such as Chinese (Chung and Hu 2007; Ku and Anderson 2003; McBride-Chang et al. 2005), among monolingual and bilingual children.

Morphological Awareness in Learning to Read Among Monolingual English Children

English orthography is often considered as morphophonemic (Carlisle 2003; Chomsky and Halle 1968), which means that the spelling system represents both phonemes and morphemes. As English has an opaque alphabetic orthography, grapheme-phoneme correspondence in English is often indirect or not always transparent. This presents challenges for learners who cannot depend totally on phonological processes to recognize words. It is not surprising that, when the relationship between individual letters and phonemes is unpredictable, morphological

awareness can play an important role in learning to read English by facilitating an understanding of the semantic relationship between words regardless of their phonological distinction (Carlisle 2003).

Research on how children develop morphological awareness has focused mainly on three types of morphology: inflections, derivatives, and compounds (for reviews, see Kuo and Anderson 2006; Koda and Zehler 2008; Carlisle 2010). Inflectional morphology is concerned with the way in which words vary to express grammatical contrasts in sentences. Derivational morphology is focused on the addition of a morpheme to change part of speech or the meaning of a base morpheme. Compound morphology refers to the formation of new words by combining two stem morphemes.

The process of acquiring implicit and explicit morphological knowledge is long and gradual for monolingual English-speaking children (Kuo and Anderson 2006). Evidence emerging from the existing literature indicates that implicit understanding of inflectional and compound morphology begins to develop before formal literacy instruction (Berko 1958; Carlisle 1995; Nagy et al. 2003), whereas knowledge of derivational morphology usually does not begin to emerge until mid-elementary grades (Anglin 1993; Ku and Anderson 2003; Wang et al. 2006). The acquisition of major inflectional rules is generally completed by early elementary grades (Berko 1958; Carlisle 1995), but awareness of compound and derivational morphology continues to develop through the elementary years and even beyond (Nagy et al. 2003).

Correlational research has confirmed that there is a strong relationship between morphological awareness and vocabulary knowledge among monolingual English-speaking children from kindergarten until grade 5 (Carlisle and Fleming 2003; McBride-Chang et al. 2005). Given the close association between vocabulary and reading comprehension (Anderson and Freebody 1981; Hudson 2007), research has confirmed that morphological awareness can facilitate reading comprehension (Carlisle 1995, 2003; Carlisle and Fleming 2003; Deacon and Kirby 2004; Nagy et al. 2003). However, some studies have shown that morphological awareness contributes uniquely to reading comprehension, beyond the mediating effect of vocabulary (Ku and Anderson 2003; Nagy et al. 2003). In a study involving students from grade 4 to 9, Nagy et al. (2003) found that morphological awareness predicted reading comprehension over and above vocabulary and other reading-related factors at all grade levels. In a comparative study, Ku and Anderson (2003) assessed morphological awareness in monolingual Chinese-speaking and monolingual English-speaking children in second, fourth, and sixth grades using a set of comparable tests of morphological awareness. They found that children's morphological awareness was more statistically significantly related to reading comprehension than to vocabulary in both English and Chinese monolingual children.

Taken together, the general trend that emerges from the existing literature is that, for English monolingual children, different aspects of morphological awareness follow different developmental trajectories. Moreover, converging evidence points to a positive relationship between morphological awareness and vocabulary and reading

comprehension with some research suggesting that the influence on reading comprehension is greater than that on vocabulary.

Morphological Awareness in Learning to Read Among Monolingual Chinese-Speaking Children

The Chinese language contrasts with the English language in mainly three ways. Firstly, in Chinese, a morpheme usually corresponds to a syllable in spoken form and to a character in written form (grapheme). Learning to read Chinese thus entails the acquisition of grapheme-morpheme correspondences. Moreover, a spoken syllable in Chinese might represent several different morphemes, and learners have to focus on meanings (instead of sounds) of the language (Chung and Hu 2007; McBride-Chang et al. 2003). Lastly, Chinese is semantically a relatively transparent language, as 75% of words are compounds made up of two or more morphemes, where the meaning of each constituent morpheme contributes directly to the meaning of the compound (Chung and Hu 2007). Therefore, researchers have proposed that morphological awareness plays a critical role in Chinese reading (Kuo and Anderson 2006; Nagy and Anderson 1999).

But it was not until recently that systematic investigations of the impact of Chinese children's emerging morphological awareness on their reading began. Given the prominent proportion of compound words in Chinese, research has mainly focused on the awareness of compound morphology. Several correlation studies conducted among kindergarten and elementary school children demonstrate that children's compound morphological awareness is associated to a significant degree with their Chinese vocabulary knowledge (Ku and Anderson 2003; McBride-Chang et al. 2005; Wang et al. 2006). Morphological awareness has also been demonstrated in a handful of studies to facilitate reading comprehension in Chinese (Ku and Anderson 2003; Li et al. 2002; McBride-Chang et al. 2007; Shu et al. 2006). Shu et al. (2006) tested phonological awareness, morphological awareness, speeded number naming, and vocabulary among 77 Chinese fifth and sixth grade children to investigate the influence of these factors on Chinese reading development. Results showed that morphological awareness was the strongest linguistic knowledge correlate of reading comprehension, even after vocabulary had been controlled for. McBride-Chang et al. (2007) also found that when several reading-related skills were taken into consideration, morphological awareness was statistically significantly associated with reading comprehension among grade 3 Chinese children.

In sum, for Chinese monolingual children, morphological awareness has a substantial influence on vocabulary and reading comprehension of school-age children. It should be noted, however, that most of the studies focused just on compound morphology.

Morphological Awareness in Learning to Read Among Bilingual Children

Despite the investigations of morphological awareness among monolingual children, little attention has been given to morphological awareness in learning to read among bilingual children. One of the reasons to expect that literacy skills might develop differently in monolingual and bilingual children is that bilingual children may have the opportunity to transfer the skills acquired for reading in one language to reading in the other (Bialystok et al. 2005). Among the few crosslinguistic studies of morphological awareness available, most focus on languages with similar orthography such as English-French (Carlisle 2003), English-Spanish (Ramirez et al. 2010), English-Hebrew (Geva et al. 1997), etc. Only a few studies have investigated morphological transfer between English and Chinese (Wang et al. 2006; McBride-Chang et al. 2007), and the results are contradictory.

Wang et al. (2006) explored crosslinguistic transfer of derivational and compound morphological awareness in English and Chinese among a group of Chinese immigrant children in first to fourth grade in America by using comparable English and Chinese morphological awareness tasks. Results indicated that English compound morphological awareness uniquely contributes to Chinese reading comprehension, even after the within-Chinese related predictors (such as age, grade, vocabulary, and phonological awareness) were controlled for, while no association was found between English derivational morphological awareness and Chinese derivational morphological awareness. This finding suggests that there is a crosslinguistic morphological transfer in acquiring two different orthographies and that the transfer stems from the morphological structure shared by English and Chinese compound morphological structure. In a recent study involving 137 first to fourth grade Chinese-English immigrant children in Canada, Pasquarella et al. (2011) also showed that the awareness of compounds could be transferred between Chinese and English. However, in a study of 6–7-year-old Hong Kong Chinese children learning English as second language, McBride-Chang et al. (2007) showed different results. They found that Chinese morphological awareness explained the unique variance in Chinese vocabulary but not in English vocabulary, indicating no transfer of compound morphological awareness.

While these findings provide useful information on the development and influence of morphological awareness on reading acquisition in both languages, further research is needed. Firstly, most of the studies were conducted among either native English-speaking or native Chinese-speaking children; it is unknown whether and to what extent the conclusions drawn from those studies can be applied to bilingual children who are learning to read in English and Chinese simultaneously. Secondly, few studies have investigated different aspects of morphological awareness simultaneously. Thirdly, although there is evidence to support that morphological awareness is directly related to vocabulary but only indirectly related to reading comprehension, a few studies suggest that morphological awareness contributes uniquely to reading skills, beyond the mediating effect of vocabulary. The explicit

nature of the relationships remains unclear. Lastly, limited crosslinguistic research has been done to examine morphological transfer in English-Chinese bilingual children.

By employing assessment of two aspects – derivational and compound – of morphological awareness, the present study explores: (1) to what extent Primary 3 English-Chinese bilingual children in Singapore demonstrate derivational and compound morphological awareness in both languages, (2) how morphological awareness is related to vocabulary and reading comprehension in English and Chinese for these children, and (3) whether there will be any crosslinguistic morphological transfer of the shared morphological structure of the two languages.

Methodology

Participants

This study involves 76 Primary 3 children from a government-funded school in Singapore. There were 39 girls and 37 boys, with a mean age of 8.72 years ($SD = 0.3$). This age group was chosen because they are considered to be in the middle of the stage during which morphological awareness may begin to play a more influential role in vocabulary and reading comprehension (Anglin 1993; Carlisle 2003). In school, these children received English-medium instruction for the English language and all other subjects, except for the teaching of Chinese language, which was conducted entirely in Chinese. An informal interview with the language teachers in the school revealed that these children had one or two sessions for both languages on a daily basis, with each session lasting for 30 min.

Children were asked to fill out a short language background questionnaire (see Appendix 1) to indicate their preferred language and the languages spoken most frequently at home among family members. Similar language practices as Aman et al. (2009) were observed: about 72% of the children reported to use both English and Mandarin as their dominant home language; 18% stated that they used only English; and 10% said that only Mandarin was used at home.

Instruments

Morphological Awareness Tasks

Two morphological awareness tasks were adapted from Ku and Anderson (2003): a Discriminate Morphemes task and a Select Interpretation task. Both tasks had an English version and Chinese version and were designed to be of comparable difficulty so as to facilitate crosslinguistic comparisons. The English and Chinese words

in all the tasks were equated with regard to frequency of usage to control for familiarity. Furthermore, because Chinese language seldom involves phonological or orthographic alteration in complex word formation, the tasks contained only word pairs from the two languages with the same orthographic and phonological form. Because children might not be able to read some of the words in the two morphological awareness tasks, teachers read each word aloud.

Discriminate Morphemes Task

This task is an odd-man-out task examining whether children understand that a shared part of a complex word may have different meanings. There are 20 groups of words, with each group consisting of three words with a common part which has the same meaning in only two of the words. Children circle the odd word, that is, the one in which the common part has a different meaning. For instance, among the words *hallway*, *doorway*, and *anyway*, *way* in the first two words has the same meaning – *opening*, *passage* – but the *way* in *anyway* has a different meaning – *case*, *respect*. Two trial items were given. The reliability for the English version was .76, for the Chinese version .77.

Select Interpretation Task

This task was to assess whether children could apply their knowledge of the morphology of compounds and derivatives to select proper interpretations for low-frequency complex words that contain high-frequency base words. There were 16 items, which were presented in the form of multiple-choice questions, and children were asked to choose the proper interpretation of each word among four choices given. For instance, *rebuild*: (1) to build a house with bricks, (2) a man whose job is to build houses, (3) a tall building, (4) to build again. Children have to understand the meaning of the prefix *re-* and the base word *build* and recognize the meaning added by the prefix to choose the correct answer. The reliability for English version was .73, for the Chinese version .79.

Vocabulary Task

The Peabody Picture Vocabulary Test-III (PPVT-III) (Dunn and Dunn 1997) was used to measure the children's vocabulary knowledge. It has two parallel forms: Form M and Form L. In administering the test, the researcher read a word twice; the students were presented with four black-and-white pictures and asked to choose the picture that best described the word heard. Succeeding words increased in difficulty.

To facilitate test administration and to shorten administration time, modifications were made so that it could be administered to groups of children. For English, items appropriate for the age group in this study were chosen from Form M, with an alpha coefficient of .95. Two trial items were given.

For Chinese, equivalent items (with an alpha coefficient of .95 for this range of items) in Form L were translated into Chinese. To validate the translation, the translated Chinese words were translated back to English by another Chinese-English bilingual graduate student. In order to ensure the appropriateness of the test items, a P3 Chinese teacher was asked to rate the items with regard to the cultural relevance and the familiarity of the content. Although measures were taken to enhance validity and reliability, the translated test is not a standardized test so the scores can only provide an approximation of children's Chinese vocabulary. Two trial items were given.

Reading Comprehension Task

English reading comprehension was assessed using the Passage Comprehension subtest from the Woodcock Reading Mastery Tests – Revised-Normative Update (WRMT-R/NU) (Woodcock 1998). Participants were required to read a short passage and identify a missing key word that makes sense in the context of the passage. For instance, upon reading "Mama, Mama, can't I have a bike?" asked Pedro. "All the boys have _____ to ride.", children are supposed to fill the blank with words like "bikes," "one," "them." Words like "some," "a," "rent," or "get" are considered as incorrect. Passages appropriate for grade 2–4 were chosen, and the median split-half reliability for this age range was .83. Two trial items were given.

Chinese reading comprehension was measured with grade-appropriate reading comprehension tests available in Singapore. Passages with same number of questions were chosen. The reliability for this task was .79.

Procedure

Permission to carry out the research was first obtained from the head of the department of the participating primary school and then from the parents of the participating children. The class teachers informed the children about the research and clarified that their participation would not affect their academic grades. All procedures for ethical research at the authors' institution were duly followed with permission granted from the affiliated university's Institutional Review Board.

Tests were administered in two sessions. During the first session, English vocabulary, reading comprehension tasks, and the two English morphological tasks were administered. On the second session, Chinese vocabulary, reading comprehension tasks, and the two Chinese morphological tasks were administered. Each test was

administered as a group test to the whole class in the children's classroom. Morphological tasks and vocabulary tests were read to the students, and reading comprehension tests were conducted in written form.

Findings

Results

Descriptive Data

Mean and standard deviation of the proportion correct for all tasks are provided in Table 6.1. The results show that Singaporean P3 bilingual children possess a certain level of morphological awareness in both languages. Since the test items in the morphological awareness tasks were designed to be of comparable difficulty in both languages, one-way analyses of variance (ANOVAs) were performed to compare the children's morphological awareness performances across languages. The results revealed that these children's scores for morphological awareness tasks in English were statistically significantly higher than those in Chinese (F (1,74) = 79.97, $p < .001$). This indicates that these children have higher level of morphological awareness in English.

To gain more insight in children's morphological knowledge of derivatives and compounds, their performances on derivational and compound morphological awareness in English and Chinese were sought as well. Table 6.2 shows the mean scores and standard deviations for derivation morphological awareness and compound morphological awareness in both languages. For English, children performed equally well on derivatives and compounds in the English morphological awareness tasks. For Chinese morphological awareness tasks, children achieved higher scores

Table 6.1 Mean percentage correct and standard deviation (SD) for all tasks

	Mean	SD
English tasks		
Discriminate Morphemes task	0.76	0.14
Select Interpretations task	0.59	0.13
Vocabulary	0.75	0.12
Reading comprehension	0.80	0.15
Chinese tasks		
Discriminate Morphemes task	0.59	0.17
Select Interpretations task	0.37	0.17
Vocabulary	0.59	0.14
Reading comprehension	0.67	0.27

Table 6.2 Performance on derivatives and compounds in both languages

	Mean	SD
English morphological awareness of derivatives	0.69	0.13
English morphological awareness of compounds	0.69	0.13
Chinese morphological awareness of derivatives	0.45	0.21
Chinese morphological awareness of compounds	0.53	0.16

Table 6.3 Morphological awareness, vocabulary, and reading comprehension in English

	English vocabulary	English reading comprehension
English morphological awareness	0.57**	0.62**
English vocabulary		0.48**

**$p < .01$

Table 6.4 Morphological awareness, vocabulary, and reading comprehension in Chinese

	Chinese vocabulary	Chinese reading comprehension
Chinese morphological awareness	0.41**	0.59**
Chinese vocabulary		0.48**

**$p < .01$

on compound words than on derived words ($t(75) = -19.81$, $p < .001$). This is consistent with the dominance of compounds in Chinese.

Morphological Awareness, Vocabulary, and Reading Comprehension in English and Chinese

Within Language

Table 6.3 provides the Pearson correlations of morphological awareness with vocabulary and reading comprehension in English.

The results show that children's English morphological awareness was statistically significantly correlated to vocabulary and reading comprehension ($r = 0.57$ and 0.62, both $p < .01$). A higher correlation was obtained between morphological awareness and reading comprehension ($r = 0.62$, $p < 0.01$) than between morphological awareness and vocabulary ($r = 0.57$, $p < .01$).

Intercorrelations of morphological awareness with vocabulary and reading comprehension in Chinese are summarized in Table 6.4.

A similar pattern of correlations was demonstrated between Chinese morphological awareness and vocabulary and reading comprehension: morphological awareness was highly correlated to vocabulary and reading comprehension, with

Table 6.5 Correlations among all measures

Variables	1	2	3	4	5	6	7
1. English derivational morphological awareness							
2. English compound morphological awareness	0.50**						
3. English vocabulary	0.49**	0.51**					
4. English reading comprehension	0.51**	0.56**	0.48**				
5. Chinese derivational morphological awareness	*0.29***	0.21	0.14	*0.38***			
6. Chinese compound morphological awareness	*0.50***	*0.34***	0.26*	*0.39***	0.62**		
7. Chinese vocabulary	0.23	0.23	0.08	0.22	0.21	0.46**	
8. Chinese reading comprehension	*0.54***	*0.42***	0.38**	0.56**	0.45**	0.58**	0.48**

**$p<.01$

higher correlation being obtained between morphological awareness and reading comprehension ($r=0.59$, $p<0.01$) than between morphological awareness and vocabulary ($r=0.41$, $p<0.01$).

Crosslinguistic Transfer

To investigate the crosslinguistic morphological transfer, correlations among derivational and compound morphological awareness and literacy measures in both languages were carried out using the Pearson correlation. Results of these analyses are shown in Table 6.5.

Since the correlations between morphological awareness, vocabulary, and reading comprehension within the same language have been reported in the previous section, here, we focus only on associations between the same tasks across both languages, indicated in bold in Table 6.5. It was found that between the same tasks in the two languages, English derivational morphological awareness correlated with Chinese derivational morphological awareness ($r=0.29$, $p<.01$). Similarly, our analyses revealed that English compound morphological awareness was also statis-

tically significantly correlated with Chinese compound morphological awareness ($r=0.34$, $p<.01$). Taken together, the significant crosslinguistic correlations would suggest that morphological awareness could be transferred across languages in children who are learning to read in English and Chinese concurrently.

It is worth noticing that English derivational morphological awareness was statistically significantly correlated with Chinese compound morphological awareness ($r=0.50$, $p<.01$). The English derivational and compound morphological awareness were also found to be associated to a significant degree with Chinese reading comprehension ($r=0.54$ and 0.42, respectively, $p<.01$). Similarly, Chinese derivational and compound morphological awareness were associated with English reading comprehension ($r=0.38$ and 0.39, respectively, $p<.01$). These results imply that morphological skills might be transferable from one language to another language.

Discussion

This study provides empirical, correlational evidence for a relationship between morphological awareness, vocabulary, and reading comprehension among English-Chinese bilingual children in Singapore. In addressing two aspects of morphological awareness, we depicted a more complete picture of derivational and compound morphological awareness in both English and Chinese. In terms of the impact on reading, our results suggest that for both languages, morphological awareness has a direct influence on reading comprehension beyond the mediating effect of vocabulary. Moreover, the results suggest there is a crosslinguistic transfer of morphological awareness.

Derivational and Compound Morphological Awareness in Both Languages

Children displayed more compound ($M=0.53$) than derivational morphological awareness ($M=0.45$) in the Chinese morphological tasks. We believe this is due to the dominance of compound morphology in Chinese. Since derivatives constitute a larger share of multi-morphemic words than compounds in English (Anglin 1993; Tyler and Nagy 1989), it was expected that children display higher derivational morphological awareness. However, the results were not entirely consistent with this hypothesis as children performed similarly on derivatives and compounds in English. The results of the comparable performance may indicate that children's development of derivational morphological awareness lags behind that of compound morphological awareness. Previous studies showed that for English monolingual children, compound morphological awareness develops before formal literacy instruction begins, whereas knowledge of derivational morphology usually does not

emerge until mid-elementary grades, during which approximately 60% of the new words are derived forms (Anglin 1993). Hence, it is possible that for the P3 Singaporean bilingual children involved in the present study, their sensitivity to the prefixes and suffixes in derivational words was only beginning to develop as they were still in the process of learning to read in English, while their knowledge of compound morphology was well under way. These developmental trends may have led to the comparable performance in these two aspects of morphological awareness in the present study.

Another factor contributing to the comparable performance in these two aspects of morphological awareness may have been the language background of the current sample. Despite receiving English-medium education, the participating children have been exposed to both English and Chinese through media and intergenerational transmission resources at home. Given the constant exposure to both languages and the prevalence of compounds in Chinese, it is possible these children have become more sensitive to compound structures in both languages, and this tendency has continued into early primary school years.

Contributions of Morphological Awareness to Reading Comprehension

Although the research design does not clarify the influence of developmental or crosslinguistic factors in English derivational morphology, results from our study reveal strong evidence of within and crosslinguistic associations of morphological awareness overall to the biliteracy development of Singaporean English-Chinese bilingual children. These are summarized below.

Within Language Association

The results demonstrate that performance in morphological tasks was statistically significantly correlated with vocabulary and reading comprehension in both languages, which further reinforces the importance of morphological awareness in literacy acquisition and is consistent with previous research of monolingual English- and Chinese-speaking children (Carlisle 2003; Carlisle and Fleming 2003; Chung and Hu 2007; Ku and Anderson 2003; McBride-Chang et al. 2005; Wang et al. 2006). The strong association of morphological awareness with vocabulary and reading comprehension may be due to the gradual increase of exposure to and acquisition of morphologically complex words through academic learning in mid-primary school years (Anglin 1993; Nagy and Anderson 1984). After children move beyond lower primary years, their reading vocabulary becomes more complex. The ability to recognize morphological relationships between words and conduct

morphological analysis enables children to decompose words into their constituent components and synthesize their meanings, that is, when children encounter unfamiliar multi-morphemic words such as *unacceptable*, they may recognize the familiar affixes un- and -able, and the base word accept, and then construct the meaning of the unfamiliar *unacceptable* from its familiar constituents. This ability is believed to greatly contribute to rapid vocabulary growth during mid-primary school years (Nagy and Anderson 1984). Given the close association between vocabulary and reading comprehension (Anderson and Freebody 1981; Hudson 2007), it would seem that morphological awareness may contribute indirectly to reading comprehension and directly to vocabulary development. Hence, a higher correlation between morphological awareness and vocabulary could be expected than between morphological awareness and reading comprehension. However, findings from our study are not consistent with this expectation. In our results, morphological awareness was found to be more related to reading comprehension than to vocabulary for both languages. Several earlier studies have reported similar results (Carlisle 1995; Ku and Anderson 2003; Nagy et al. 2003). This may indicate that morphological awareness is associated directly with reading comprehension, beyond the mediating effect of vocabulary. The underlying cause may be that, although understanding the pronunciations and definitions of specific words can facilitate comprehension of those words, it is less likely to help children decipher the meanings of other words or to generate original words in different contexts (Kirby et al. 2008). Therefore, skills that tap into deciphering the meaning of words and understanding word formation rules – such as morphological awareness – can assist children in learning new words across contexts.

Another possible explanation is that morphemes carry both semantic and syntactic meaning, which can be helpful in constructing meaning from text. Morphological insights can provide clues to the semantic decomposition process and the grammatical roles of words within sentences, whereby familiar morphemes are recognized within an unfamiliar context and are used to construct meaning. Therefore, morphological awareness may influence reading comprehension directly by assisting children derive semantic and syntactic information. However, there seems to be a threshold developmental level for morphological awareness to contribute independently to reading comprehension. In a longitudinal study, involving children from kindergarten and grade 1, Carlisle (1995) found a strong relationship between morphological awareness and reading comprehension among grade 1 children, but not in kindergarten children. Nagy et al. (2003) also found no association between morphological awareness and reading comprehension among younger children. They argue, therefore, that children may need to reach certain level of morphological awareness before they can utilize their morphological skills as a tool for comprehending a text.

Crosslinguistic Association

According to Cummins' Common Underlying Proficiency (CUP) theory (Cummins 1991, 2000), academic language proficiency and cognitive ability may be transferable across languages. Although the surface features, such as pronunciation and spelling, of any two languages may be different, an underlying cognitive proficiency supported by shared knowledge derived from learning/experience and the cognitive and linguistic abilities of the learner is common across languages. With adequate linguistic exposure and experience in the two languages, learners can be expected to develop common underlying proficiency skills which can be transferred from one language to the other.

The probability of such transfer depends on the extent to which the languages share semantic and syntactic structures. In Chinese, each morpheme represents an independent meaning in a complex word (dual or triple morpheme words). Words constructed with the same morpheme usually have similar meanings as they provide semantic information related to the original meaning of the morpheme. Examples of such complex dual morpheme words are 面 (flour)+包=bread, 面粉 (flour-powder), and 面条 (flour-noodle). English compound words function similarly to Chinese compound words, that is, two words in a compound word make up an independent meaning, for instance, *moonlight* and *sunshine*. This leads to the hypothesis that crosslinguistic morphological transfer occurs for the compound morphology between the two languages. The results tend to confirm this hypothesis by showing a significant correlation between English compound morphological awareness and Chinese compound morphological awareness which is consistent with the studies conducted by Wang et al. (2006) and Pasquarella et al. (2011).

One of the most interesting findings in this study is that the correlation between English derivational morphological awareness and Chinese compound morphological awareness ($r=0.50$, $p<.01$) was higher than that between English compound morphological awareness and Chinese compound morphological awareness ($r=0.34$, $p<.01$). To elucidate the implication of this result, we need to first consider the derivational words included in the English morphological awareness tasks. As mentioned earlier, those derivational words do not involve phonological or structure changes, and the affixes for the derivatives are of high frequency and productive, such as *dis-*, *-er*, *re-*, etc. The way to form such derivatives is to join affixes and base words, which is very similar to compound word formation rules. For example, when children come across the word 'rebuild' for the first time, they may recognize the familiar affix re- and base word 'build,' and then construct the meaning of the unfamiliar word based on its familiar constituents. Therefore, the process of decomposing such derivational words is similar to that of Chinese compounds. Given that English derivational morphological awareness just began to emerge among these children and their Chinese compound morphological awareness was well underway, this result may suggest that children can apply their knowledge of Chinese compound morphology (combining roots) in the learning of English transparent derived words that do not involve phonological or orthographic alterations.

These findings not only lend support to Cummins' CUP theory but may also help to explain the close association between morphological awareness in one language and reading comprehension in another language. The ability to combine several semantic units, which is central to morphological awareness, may influence the real-time processing of reading passages.

Conclusion

Results from the present study fill some gaps in the understanding of the role of morphological awareness in literacy development. Firstly, it shows that the links between morphological awareness, vocabulary, and reading comprehension found among English and Chinese monolingual children are equally important for learning to read in both languages for children who learn concurrently to read in English and in Chinese. Secondly, the present study depicts a more complete picture of morphological awareness in both languages by including assessment of two aspects of morphological awareness – derivational and compound. Moreover, this study suggests that language transfer can occur for morphological awareness.

An important pedagogical implication arising from the findings of the study is to incorporate morphology into Chinese literacy instruction. English word formation rules such as derivational principles governing high-frequency and productive affixes (e.g., –er, un-, etc.) have been introduced during early primary years in Singapore (Ministry of Education [MOE] 2001), though not all schools put equal emphasis on these learning points (see Zhang and Li, this volume, Chap. 12). In contrast, Chinese language instruction has mainly focused on learning to pronounce and write the characters correctly rather than on analyzing the morphological structure of words (MOE 2007) Given the close association of morphological awareness with vocabulary and reading comprehension, promotion of students' Chinese morphological awareness should be seen as a metalinguistic tool to increase vocabulary and enhance reading comprehension in Chinese.

More importantly, findings from the present study highlight the critical role that language background, language structure, and medium of instruction play on bilingual children's morphological awareness development. Being bilingual may not on its own have a monolithic effect on the establishment of morphological awareness in either language; rather, biliteracy development is a series of interactions of bilingualism, language learning environment, language structures, and the focus of language instruction. Therefore, to understand how Singaporean Chinese bilingual children become literate in English and Chinese, a variety of factors must be taken into consideration, such as language learning environment, different features of English and Chinese language, and language instruction in school.

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Appendix 1

Language Background Questionnaire

Please fill in the blanks and tick "✓" at the "☐" where necessary

1. Name _____ 2. Class _____

3. Date of birth: ____/ ____/ ____ 4.☐ Boy ☐ Girl
(day / month / year)

5. Please tick "✓"where necessary

	English	English and Mandarin	Mandarin	Mandarin and/or Chinese dialect	Malay	Tamil	Others
Language used between parents							
Language used from parents to you							
Language used from you to parents							

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