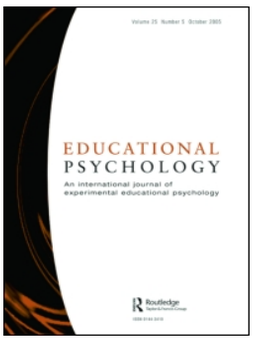

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Bilingualism and morphological awareness: a study with children from general education and Spanish-English dual language programs

Li-Jen Kuo[a]*, Gloria Ramirez[b], Sharon de Marin[a], Tae-Jin Kim[c] and Melike Unal-Gezer[a]

[a]*Teaching Learning and Culture, Texas A&M University, College Station, TX, USA;* [b]*Faculty of Human, Social and Educational Development, Thompson Rivers University, Kamloops, BC, Canada;* [c]*Independent Researcher, Taiwan*

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Existing research on the impact of bilingualism on metalinguistic development has concentrated on the development of phonological awareness. The present study extended the scope of existing research by focusing on morphological awareness, an aspect of metalinguistic awareness that becomes increasingly important beyond the initial phase of literacy development. Participants included three groups of fourth-grader children from the same school with comparable SES and non-verbal IQ: (a) monolingual English-speaking children from a general education programme, (b) Spanish-speaking children from a Spanish–English dual-language programme and (c) English-speaking children from the same Spanish–English dual-language programme. Researcher-developed measures of vocabulary and morphological awareness were administered. Results suggested that bilingual education can have a positive impact on the development of morphological awareness through cross-language transfer as well as increased sensitivity to structural language features. The findings contribute to a growing body of research on how bilingual experience may shape children's metalinguistic development.

Keywords: bilingualism; biliteracy development; dual-language programme; morphological awareness

Introduction

Psychologists have long been intrigued by how bilingual experience affects children's metalinguistic awareness development, the ability to metacognitively manipulate linguistic units and reflect upon structural properties of language (e.g. Bialystok, 2001; Hakuta & Diaz, 1985; Nagy & Anderson, 1998). Metalinguistic awareness has been identified as one of the strongest predictors of language and literacy development for first as well as second-language learners (Kuo & Anderson, 2008). Among the aspects of metalinguistic awareness being investigated in bilingual cognition research, phonological awareness, the ability to manipulate and reflect upon sound units, has received the most attention (Bialystok, 2001, 2002). Phonological awareness has received much attention because it has been shown to

*Corresponding author. Email: lijenkuo@tamu.edu

play a vital role in learning to read among first-language learners (e.g. Bradley & Bryant, 1983) and second-language learners (e.g. Geva & Ryan, 1993).

Positive bilingual effects on phonological awareness have been identified among children who speak two typologically related languages (Bruck & Genesee, 1995; Campbell & Sais, 1995), whereas a null or even negative bilingual effect has been revealed among bilinguals who speak two typologically distant languages (e.g. Bialystok, Luk, & Kwan, 2005). The observed differences in phonological awareness development between bilinguals and monolinguals have largely been attributed to the effect of cross-language transfer (Bialystok et al., 2005; Durgunoğlu, 2002; Durgunoğlu, Nagy, & Hancin-Bhatt, 1993; Hu, 2013). More recently, using stimuli that were comparably unfamiliar to both the bilingual and the monolingual groups, Kuo and Anderson (2010, 2012) demonstrated that the bilingual advantage in phonological processing may go beyond cross-language transfer. Their findings have led them to propose the *structural sensitivity theory*, which postulates that children with regular exposure to two languages may develop unique sensitivity to structural features of language and therefore become cognitively more flexible in processing linguistic input.

While the ability to manipulate sound units and to detect sound patterns is fundamental, language acquisition and literacy development must ultimately reach a level where children can integrate linguistic information beyond the sound level. The present study aims to fill this gap by examining bilingual and monolingual fourth-graders' morphological awareness and syntactic awareness – two aspects of metalinguistic awareness that become progressively more important beyond the initial phase of literacy development (Kuo & Anderson, 2006).

Morphological awareness in monolinguals and bilinguals

Morphological awareness refers to the ability to recognise and manipulate morphemes to form words in a language (Kuo & Anderson, 2006). Morphemes are the smallest intra-word units that represent semantic information. For example, the word *agree* consists of one morpheme and is therefore morphologically simple; the word *agreement* is a morphologically complex (MC) word composed of two morphemes: the base *agree* and the suffix *-ment*, which denotes the lexical category (e.g. noun) of the word.

Morphological awareness is a crucial aspect of metalinguistic awareness in literacy development for several reasons. First, morphemes carry semantic information and encode both phonological and syntactic properties (Kuo & Anderson, 2006). Morphological awareness is thus integrally related to other aspects of metalinguistic knowledge and serves as a 'more general index of metalinguistic capability' than phonological or syntactic awareness considered alone (Carlisle, 1995, p. 192). Second, psycholinguistic research has shown that morphological awareness facilitates the process of comprehending, storing and retrieving words composed of multiple morphemes (Clahsen, Felser, Neubauer, Sato, & Silva, 2010). Thus, children with better morphological awareness may have an advantage in acquiring and retaining MC vocabulary.

Expedited learning of MC vocabulary is particularly important because such vocabulary makes up 60–80% of the new words acquired by school-aged children (Nagy & Anderson, 1984). Several large-scale correlational (Nagy, Berninger, & Abbott, 2006; Tong, Deacon, Kirby, Cain, & Parrila, 2011) and intervention studies

(e.g. Baumann et al., 2002; Bowers, Kirby, & Deacon, 2010; Goodwin & Ahn, 2010) have demonstrated that morphological awareness is a powerful predictor of reading comprehension, especially for students from mid-elementary grades to late adolescence, when reading texts that contain greater numbers of MC words (e.g. Carlisle & Stone, 2003). Parallel with the findings concerning monolingual children, studies involving bilinguals also showed that morphological awareness made a significant contribution to reading comprehension beyond several literacy-related measures, including vocabulary (Apel, Wilson-Fowler, Brimo, & Perrin, 2012; Zhang & Koda, 2013), phonological awareness (Siegel, 2008), oral language skills (Siegel, 2008), word reading fluency (Kieffer & Lesaux, 2012) and grammatical knowledge (Zhang & Koda, 2013).

Despite recent interest in morphological awareness among second-language learners (e.g. Kieffer & Lesaux, 2008, 2010; Marinova-Todd, Siegel, & Mazabel, 2013), little attention has been given to how bilingualism may have an impact on morphological awareness. Existing cross-linguistic research suggests that cross-language transfer may play a role (e.g. Zhang et al., 2010); nonetheless, there is a general lack of research in direct comparison of morphological awareness between monolingual and bilingual children (for an exception, see Siegel, 2008), as in the body of research concerning the impact of bilingualism on phonological awareness. There is even less research on how bilingualism may impact morphological awareness beyond cross-language transfer, which points to the need for the present study.

Cognate awareness

One unique aspect of morphological awareness among bilingual children of two typologically related languages is *cognate awareness* (e.g. Goodwin, Huggins, Carlo, August, & Calderon, 2013; Ramírez, Chen, & Pasquarella, 2013). Cognates refer to words that have derived from the same linguistic origin and therefore share the same or similar meaning and spelling. It has been estimated that approximately 60% of the English words are of Latin or Greek origin; a majority of them have cognate equivalents in Romance languages, such as Spanish (Nation, 1990). Cognate awareness may play a particularly important role in the literacy development of bilingual children of English and Spanish because many high-frequency conversational words in Spanish (e.g. *rapido*) are low-frequency academic words in English (e.g. *rapid*) (Proctor & Mo, 2009). Research has shown that Spanish-speaking English language learners (ELLs) outperformed their English-speaking monolingual peers in recognising the meaning of Spanish–English cognates (Proctor & Mo, 2009). Furthermore, cognate awareness has been found to be closely correlated with reading comprehension in English among Spanish-speaking ELLs (Proctor & Mo, 2009; Ramírez et al., 2013). However, little is known about whether English-speaking learners of Spanish would also demonstrate enhanced cognate awareness, which may expedite their acquisition of academic vocabulary in English.

The present study

The present study aims to extend the scope of existing research in several directions. First, the study expands current research on bilingualism and metalinguistic awareness, which has primarily focused on phonological awareness, by focusing more specifically on the development of morphological awareness, an aspect of

metalinguistic awareness that becomes progressively more important beyond the early phase of literacy development. Second, as pointed out by Kuo and Kim (2014), one of the major confounding factors in most of the existing research that examines the effect of bilingualism on metalinguistic development concerns the comparability of the groups: the bilingual group has been frequently compared on metalinguistic tasks in their second language with a monolingual group for whom that second language is their native language. The present study attempts to disentangle this confounding factor by including the English-speaking children in the two-way immersion programme, who were compared to their monolingual peers in English, the first language of both groups.

Finally, the present study distinguishes itself from existing research in the measures used for assessing morphological awareness. Most of the existing research with second-language learners has used measures that were originally designed for monolingual children (e.g. Lesaux & Kieffer, 2010). While the measures were well-designed and had high internal consistency and reliability, there has been little attention afforded to the structural similarities and differences between the bilingual children's two languages. The present study, to our knowledge, is the first that systematically takes into account the linguistic structures of the bilinguals' two languages in designing morphological awareness measures.

Research questions

The study aims to address the following two research questions:

(1) How do English-speaking and Spanish-speaking children in a dual-language programme differ in their vocabulary and morphological awareness in Spanish?
(2) How do these young second-language learners differ from their monolingual English-speaking peers in the general education programme in vocabulary and morphological awareness in English?

Method

Participants

The study was conducted at two elementary schools from the same school district in a Midwestern suburb in the US. The two schools offered general education and Spanish–English dual-language programmes. Participants included 99 fourth-graders: 24 were monolingual English-speaking children enrolled in the general education programme (Eng-GenEd); 29 were English-speaking children enrolled in the Spanish–English dual-language programme (Eng-Dual); and 46 were Spanish-speaking children enrolled in the Spanish–English dual-language programme (Spn-Dual). None of the participating students had documented learning disability.

The general education programme consisted of only English-speaking students; the only language of instruction was English. The Spanish–English dual-language programme consisted of two groups of students, native speakers of English and native speakers of Spanish. Students received approximately 15 hours of instruction in English and 15 hours of instruction in Spanish per week. Literacy was taught in both English and Spanish using a basal curriculum starting from the first grade.

Based on our observations and interviews with the teachers, morphology had not been explicitly taught at the time of data collection. Math instruction was in English, but students who met the grade-level standard were enriched through Spanish math instruction. Music and physical education were exclusively taught in English, while art was always taught in Spanish. The content areas of science and social studies alternated between Spanish and English depending upon the grade level; at the fourth grade level, both subjects were taught in English. The teachers from the general education and dual-language programmes met weekly to ensure consistency of the curriculum across the programmes.

The principals from the two schools indicated that the community-valued bilingualism and viewed the dual-language programme as an enrichment programme. Except for the parents of children with learning disabilities, most parents, English-speaking as well as Spanish-speaking, preferred their children to be enrolled in the dual-language programme. Therefore, the school usually maintained a long wait list for the dual-language programme.

A home language use survey revealed that the three groups were comparable in age ($M = 9;6$) and the educational levels of the mothers, $\chi^2(3) = 5.96$, *n.s.* Results from the spatial reasoning sections of the cognitive ability test (Cox, 1969) confirmed that the three groups were also comparable in non-verbal IQ, $F(2, 94) = 2.32$, *n.s.*

Instruments

Vocabulary and morphological awareness

This researcher-developed test was used to assess participants' vocabulary and morphological awareness with words varying in origin, morphological complexity and frequency. Participants were asked to select out of four choices the one that best explains the target word. The measure contained 60 items with four types of target words: (a) low-frequency, morphologically simple words (LMS); (b) high-frequency, morphologically simple words (HMS); (c) MC words; and (d) Spanish–English cognates (CN). All MC words on the measure were derivational words. MC words had the same whole-word frequency as the LMS words and the same stem frequency as the HMS words. The CN words and the LMS word were matched on frequency. All of the CN words were morphologically simple. Items on the test were either created by the first and second authors or selected from the vocabulary section of the Gates–MacGinities test or a cognate test developed by the Centre for Applied Linguistics (Malabonga, Kenyon, Carlo, August, & Louguit, 2008). The reliability of the vocabulary measure was $\alpha = .95$. To minimise decoding effect, participants were offered help if they had difficulty decoding any of the test items.

Following Malabonga et al. (2008), frequency, the number of occurrences of a word in a corpus of one million words, served as an indicator of the difficulty of a word. Frequency information for the English words was retrieved from an online database created by Kucera and Francis (2009); frequency information for the Spanish words was retrieved from an online database created by Davies (2009). Table 1 presents the *whole-word frequency* and the *stem frequency* of the four types of words on the measure, along with a sample question for each type of the word. *Whole-word frequency* refers to the frequency of a word itself. For example, the *whole-word frequency* of the word *modernise* indicates how often *modernise* occurs

Table 1. Means and standard deviations (SD) of the frequency of the words in the word association task.

Type	Morphological complexity	Whole-word frequency* Mean (SD)	Stem frequency* Mean (SD)	Example
LMS (low-frequency morphologically simple	Simple	3 (1.85)	NA	Plunge: (a) trip; (b)dive; (c) tone; (d) pleasure
CN (cognates)	Simple	3 (1.94)	NA	Tranquil: (a) calm; (b) worried; (c) unsure; (d) sad
MC (morphologically complex)	Complex	3 (1.85)	127 (61)	Modernise: (a) new; (b) make something new; (c) look new; (d) very new
HMS (high-frequency morphologically simple)	Simple	131 (65)	NA	Reason: (a) discovery; (b) reaction; (c) cause; (d) question

*Per million words.

in a corpus of one million words. The *stem frequency* of the word *modernise* indicates how often the word *modern*, which is the stem of the word *modernise*, occurs.

Participants' relative performance on these different types of words varying in origin, morphological complexity and frequency allowed us to gauge their morphological awareness and cognate awareness. First, the MC words had the same whole-word frequency as the LMS words and the same stem frequency as the HMS words. If participants had not developed any morphological awareness, they would not be able to recognise or analyse the structure of the MC words, thus treating them as LMS words. Essentially, they would perform similarly on the MC words and the LMS words. In contrast, if participants had a full grasp of the morphological rules of the language and could analyse the structure of these complex words, they would perform similarly on the MC words and the HMS words. This is because the HMS words and the stem of the MC words were matched on frequency and therefore of similar difficulty; once the stem of an MC word is recognised, the meaning of the MC can be inferred with knowledge of the morphological rules. It should be noted that participants were likely to have already learnt the MC word as a whole and thus did not necessarily need to analyse the morphological structure of the target words to answer the questions correctly. Therefore, assessment of their morphological awareness should always take into account their general vocabulary proficiency.

Second, the LMS words and the cognates were both morphologically simple and were matched on whole-word frequency. The two types of words differed in that none of the LMS words had corresponding cognates in Spanish, but (a) all of the cognate words had corresponding cognates in Spanish and (b) the cognates had a higher frequency in Spanish than in English. In other words, children with regular exposure to Spanish were more likely to acquire cognates in Spanish first and encounter these words in cross-linguistic contexts. If these children were able to transfer their knowledge of cognates from Spanish when reading corresponding English words, they should outperform their monolingual counterparts on the

cognates over the LMS words. However, if they were unaware of the cross-linguistic cognate relationship, they would most likely treat the cognates as LMS words, thus performing similarly on these two types of words.

Morpho-syntactic awareness

A morpho-syntactic awareness measure was developed following the design of *Does It Fit* in the *Process Assessment of Learners* (Berninger, 2001) but with the consideration of the structural similarities and differences between Spanish and English. This task has been widely used in research on morphological awareness (e.g. Kieffer & Lesaux, 2010, 2012); however, because the task tapped into both morphological knowledge and syntactic knowledge (i.e. how words of different lexical categories should be combined to form sentences), we referred to it as a measure of *morpho-syntactic awareness* in the present study.

Participants were asked to complete a sentence using a pseudo-word with an existing derivational suffix. For example, *She showed no – when she heard the news.* (*a*) *vullion,* (*b*) *vullful,* (*c*) *vully,* (*d*) *vullify.* To accurately answer the question, participants would need to (a) identify the lexical category of the word in the blank (i.e. noun); and (b) select the pseudo-word with the suffix that denotes the lexical category. Three types of derivational suffixes were included in this measure: (a) *cognate-same*, which are cognate suffixes that are orthographically the same in English and Spanish (e.g. *-able*); (b) *cognate-parallel*, which are also cognate suffixes, but with slight spelling differences across the two languages (e.g. *-ary* in English and *–ario* in Spanish); and (c) *unique*, suffixes that are *unique* to English and do not have corresponding cognates in Spanish (e.g. *–ful)*. The measure consisted of 18 items with a reliability at $\alpha = .84$.

Spanish measures

Parallel measures of vocabulary, morphological awareness and morpho-syntactic awareness in Spanish were developed following the same experimental paradigms for the English measures. While corpus analysis of academic texts, as in Nagy and Anderson (1984) with English, has not been conducted with Spanish, comparative linguistic research has shown that Spanish and English share many similar derivational processes (Whitley, 2002). Furthermore, empirical studies with Spanish-speaking children have shown that morphological awareness is a critical component in learning to read in Spanish (e.g. Lázaro, 2012; Lázaro, Camacho, & Burani, 2013; Lazaro, Schreuder, & Aceituno, 2011).

The reliabilities of the researcher-developed Spanish tasks were $\alpha = .89$ for the vocabulary and morphological awareness measures and $\alpha = .75$ for the morpho-syntactic measure.

Results

Results from the Spanish measures are reported first to provide information about the Spanish proficiency of English-speaking and Spanish-speaking children in the dual-language programme. We then report findings from the English measures, which compared the participants from all three groups. Percentage correct was calculated for all measures.

Spanish measures

Vocabulary and morphological awareness

Data from the vocabulary and morphological awareness assessment were submitted to a repeated ANOVA with Group [Eng-Dual: English-speaking children enrolled in the Spanish-English dual language programme v.s. Spn-Dual: Spanish-speaking children enrolled in the Spanish-English dual-language programme] as the between-participant variable and Word Type [HMS, LMS, MC and CN, see Table 1] as the within-participant variable. The means and standard deviations are summarised in Table 2. The analysis revealed a significant main effect of Word Type, $F(3, 65) = 11.28$, $p < .05$, $\eta^2 = .34$, and the interaction between Group and Word Type was also significant, $F(3, 65) = 3.90$, $p < .05$, $\eta^2 = .16$. Further analysis revealed that the Spanish-speaking children performed significantly better than the English-speaking children on low-frequency morphologically simple words, $F(1, 67) = 14.32$, $p < .001$, $\eta^2 = .18$, HMS, $F(1, 67) = 9.47$, $p < .005$, $\eta^2 = .12$, and cognates, $F(1, 67) = 9.24$, $p < .005$, $\eta^2 = .12$; the two groups performed similarly on MC words, $F(1, 67) = .44$, $p = .51$. Taken together, these findings show that after being in the programme for four and a half years, the English-speaking children still lagged behind their Spanish-speaking peers in general vocabulary.

Findings from contrast analyses by group showed that both groups performed significantly better on high-frequency words than on the MC words ($F(1, 25) = 3.89$, $p < .05$, $\eta^2 = .12$ for Dual-English, and $F(1, 42) = 41.06$, $p < .001$, $\eta^2 = .49$ for Dual-Spanish). Furthermore, the differences between scores on the low-frequency words and MC words did not reach statistical significance for either group. These findings suggest that neither group seemed to have developed substantial morphological awareness in Spanish that allowed for the analysis of MC words, and thus, they processed MC words as if they were low-frequency words and were not able to efficiently extract the stems or recognise the suffixes to interpret the meanings of these MC words with low whole-word frequency but high stem frequency.

Morpho-syntactic awareness

Means and standard deviations for the morpho-syntactic measures are presented in Table 2. An ANOVA was conducted with Group as the between-participant variable

Table 2. Means and standard deviations of the Spanish measures by participant background.

	Participant background	
Measures	Spanish-speaking students in dual-language programme	English-speaking students in dual-language programme
Vocabulary and morphological awareness		
Low-frequency morphologically simple	.40 (.15)	.26 (.13)
Spanish–English cognates	.38 (.21)	.24 (.15)
Morphologically complex words	.39 (.14)	.26 (.16)
High-frequency morphologically simple	.52 (.26)	.33 (.21)
Morpho-syntactic awareness		
Cognate-same	.52 (.33)	.40 (.21)
Cognate-parallel	.44 (.24)	.33 (.21)
Unique	.46 (.21)	.43 (.23)

and Word Type as the within-participant variable. The analysis revealed that the main effect of Group did not reach statistical significance, $F(1, 68) = 3.24$, $p = .08$. A significant main effect of Word Type, $F(2, 67) = 5.57$, $p < .001$, $\eta^2 = .14$, and a significant interaction between Group and Word Type, $F(2, 67) = 3.90$, $p < .05$, $\eta^2 = .02$, were observed. The English-speaking children performed significantly better on the cognate-same suffixes, $F(1, 26) = 4.21$, $p < .05$, $\eta^2 = .14$, and the unique suffixes, $F(1, 26) = 4.49$, $p < .05$, $\eta^2 = .15$, than on the cognate-parallel suffixes. The Spanish-speaking children performed significantly better on the cognate-same suffixes over the cognate-parallel suffixes as well, $F(1, 42) = 5.58$, $p < .05$, $\eta^2 = .12$, but the difference between the cognate-parallel suffixes and the unique suffixes did not reach statistical significance, $F(1, 42) = .26$, $p = .61$. The findings suggest that both groups seem to benefit from having access to suffixes that share the same function and spelling across the two languages over those that share the same function but differ in spelling. The English-speaking children's superior performance on the unique suffixes over the parallel suffixes, though potentially puzzling at first sight, could be attributed to the saliency effect. Learners' attention may be more readily directed to the aspects of information that they find more salient and distinct from what they have learnt and that unique attention may enhance learning. In contrast, when new information and existing knowledge are similar but also different in critical ways (e.g. suffixes that share the same function but differ in spelling), it may be confusing to learners, which might impede learning.

While morpho-syntactic awareness was constructed with high-frequency words to minimise the influence of vocabulary on this morpho-syntactic measure, the analysis of *Vocabulary and Morphological Awareness* data showed that the English-speaking children performed significantly lower than their Spanish-speaking peers on high-frequency words. Thus, additional analyses with the high-frequency vocabulary in Spanish as a covariate were also performed. Inclusion of high-frequency vocabulary words in the analyses did not change any of the patterns revealed.

English measures

Vocabulary and morphological awareness

Data from this measure were submitted to an ANOVA with Group as the between-participant variable [Eng-GenEd: monolingual English-speaking children enrolled in the general education programme; Eng-Dual: English-speaking children enrolled in the Spanish-English dual-language programme v.s. Spn-Dual: Spanish-speaking children enrolled in the Spanish-English dual-language programme] as the between-participant variable and Word Type [HMS, LMS, MC and CN, see Table 1] as the within-participant variable. The means and standard deviations are summarised in Table 3. The analysis revealed a significant interaction between Group and Word Type, $F(3, 84) = 18.79$, $p < .001$, $\eta^2 = .40$. Further analyses showed that on the measures of low-frequency and HMS words, the two English-speaking groups (monolinguals and English-speaking children in dual language) performed significantly better than the Spanish-speaking group (LMS: Scheffe, $p < .001$; HMS: Scheffe, $p < .05$). Yet patterns showing bilingual advantage in morphological awareness and cross-language transfer of cognate knowledge were also revealed. The English-speaking children in the dual-language programme outperformed English-monolingual peers on cognates (Scheffe, $p < .05$) and MC words (Scheffe, $p < .05$). Despite scoring

Table 3. Means and standard deviations of the English vocabulary measures by programme and participants background.

	Participant backgrounds		
	Monolingual students in general education	English-speaking students in dual-language programme	Spanish-speaking students in dual-language programme
Vocabulary and morphological awareness			
Low-frequency morphologically simple words	.54 (.19)	.53 (.20)	.35 (.20)
Spanish–English cognates	.48 (.14)	.60 (.18)	.52 (.21)
Morphologically complex words	.50 (.18)	.64 (.22)	.47 (.17)
High-frequency morphologically simple words	.69 (.23)	.66 (.28)	.52 (.24)
Morpho-syntactic awareness			
Cognate-same	.46 (.24)	.58 (.27)	.46 (.25)
Cognate-parallel	.43 (.20)	.42 (.18)	.33 (.20)
Unique	.45 (.22)	.56 (.26)	.48 (.29)

significantly lower on low- and HMS words, the Spanish-speaking group in the dual-language programme performed similarly to the English-monolinguals on measures of cognates ($p = .80$) and MC words ($p = .80$).

Furthermore, the English-monolinguals scored significantly lower on the MC words, $F(1, 22) = 28.28$, $p < .001$, $\eta^2 = .56$, and the cognates (CG), $F(1, 22) = 21.32$, $p < .001$, $\eta^2 = .49$, than on the HMS words. The difference between LMS and CG as well as the difference between LMS and MC did not reach statistical significance ($p > .05$). In other words, the English-monolingual children treated LMS and MC the same, suggesting their lack of morphological awareness. In contrast, for the two groups of children in the dual-language programme, the differences between HMS and CG and that between HMS and MC did not reach statistical significance. However, the two groups scored significantly higher on CG and MC words than on LMS words (Eng-Dual – CG: $F(1, 26) = 5.54$, $p < .05$, $\eta^2 = .18$; MC: $F(1, 26) = 17.66$, $p < .001$, $\eta^2 = .40$; Spn-Dual – CG: $F(1, 38) = 25.71$, $p < .001$, $\eta^2 = .40$; MC: $F(1, 38) = 23.53$, $p < .001$, $\eta^2 = .38$). Recall that the CN and MC words have the same whole-word frequency as the LMS words, the cognates have higher frequency in Spanish than in English, and the stems of the MC words have the same frequency as the high-frequency words. Therefore, the findings suggest that the two groups of participants in the dual-language programme showed more advanced development of morphological awareness than their peers in the general education programme. Their development of English vocabulary seems to have been enhanced by their recognition of cognates between Spanish and English.

Morpho-syntactic awareness

Means and standard deviations are presented in Table 3. A repeated measure analysis of variance was conducted with Suffix Type (cognate-same, cognate-parallel and unique) as the within-participant variable and Group as the between-participant variable. Neither the effect of Group, $F(2, 89) = .86$, $p = .43$, nor the effect of Suffix

Type, $F(2, 88) = .57$, $p = .58$, was significant, but the interaction between Group and Suffix Type reached statistical significance, $F(2, 89) = 2.57$, $p < .05$, $\eta^2 = .51$. Further analyses revealed that the English-speaking children in the general education programme performed similarly on the three types of suffixes, $F(2, 21) = 2.40$, $p = .12$, but the performance by children in the dual-language programme varied significantly across the three types of suffixes (Dual-Eng: $F(2, 25) = 4.95$, $p < .05$, $\eta^2 = .28$; Dual-Spn: $F(2, 41) = 7.41$, $p < .05$, $\eta^2 = .27$). The pattern mirrored results from the Spanish version of the assessment: both groups performed significantly better on the cognate-same suffixes (i.e. suffixes that share the same function and spelling) than cognate-parallel suffixes (i.e. suffixes that share the same function but differ in spelling) in English and Spanish (Dual-Eng: $F(1, 26) = 9.04$, $p < .01$, $\eta^2 = .26$; Dual-Spn: $F(1, 42) = 8.94$, $p < .01$, $\eta^2 = .18$). The results also revealed significantly better performance on the suffixes that are unique in English than on cognate-parallel suffixes (Dual-Eng: $F(1, 26) = 7.04$, $p < .05$, $\eta^2 = .21$; Dual-Spn: $F(1, 42) = 10.32$, $p < .01$, $\eta^2 = .20$). Furthermore, contrast analysis revealed that the English-speaking children in a dual-language programme outperformed their monolingual peers on cognate-same suffixes ($p = .05$), but the difference between English-monolinguals and the Spanish-speaking children in the dual-language programme did not reach statistical significance ($p = .28$). These parallel findings from the Spanish and the English assessments demonstrated that the bilingual children benefited from cross-language transfer of cognate suffixes as well as the saliency of suffixes that were present in only one of the two languages. However, cognate-parallel suffixes may have caused some confusion and resulted in relatively poorer performance within individuals. It should be noted, however, that the English-speaking children in the dual-language programme performed similarly with them on the cognate-parallel suffixes. Therefore, despite receiving less instruction in English than their monolingual peers in the general education programme and a potential, negative cross-language impact on the acquisition of certain types of suffixes, the English-speaking children in the dual-language programme performed on par with their English-monolingual peers.

As in the analysis of the Spanish data, additional analyses with the high-frequency vocabulary in English as the covariate were also performed. Inclusion of high-frequency vocabulary words in the analyses did not change the major patterns revealed in the analyses without the covariate.

Discussion

Prompted by a greater commitment to pass heritage languages on to the next generation and escalating requirements for multilingual competence to navigate the global economy, the past decade has witnessed a rapid growth in the range of new alternative education programmes based on language options in the US (Center for Applied Linguistics, 2014) and in other industrialised countries (e.g. Freeman, Freeman, & Mercuri, 2005; Kam, 2002), as well as an urgent need to better understand how early bilingual experience shapes the literacy development of young second-language learners from different educational programmes and with varying language backgrounds. Nonetheless, the majority of the research has focused on the development of phonological awareness and on second-language learners from general education or heritage language programmes (Bruck & Genesee, 1995; Campbell & Sais, 1995; Chen et al., 2004).

Informed by a broader goal of accumulating a research base regarding the impact of bilingualism on literacy development, the present study extended the scope of existing research in three directions. First, the present study examined vocabulary and morpho-syntactic skills, which are pivotal componential skills for young children progressing beyond the initial phase of reading acquisition (Deacon, Kieffer, & Laroche, 2014; Kieffer & Box, 2013). Second, the present study focused on the metalinguistic skills of an increasing yet under-researched population: young second-language learners enrolled in two-way bilingual programmes where the languages of instruction include both their first and second languages. Finally, to address methodological limitations in existing research related to the impact of bilingualism on literacy development (Kieffer & Lesaux, 2012; for a review, see Kuo & Kim, 2014), metalinguistic measures with specific considerations of the structural similarities and differences between the participants' first and second language were developed in the present study.

The remainder of this section is organised to address the two research questions.

How do English-speaking and Spanish-speaking children in a dual-language programme differ in their vocabulary and morphological awareness in Spanish?

Results from the Spanish measures showed that after having attended the dual-language programme for four and a half years, the English-speaking children did not perform on par with their Spanish-speaking peers on the measures of morphologically simple vocabulary, including high-frequency and low-frequency words as well as Spanish-English cognates. This finding is consistent with previous research showing that while it is likely for Spanish-speaking children in dual-language programmes to become proficient in English around grade three, the same trend has not been observed with English-speaking children developing proficiency in Spanish at the same juncture (Lindholm-Leary & Howard, 2008).

However, despite having a smaller vocabulary in Spanish, the English-speaking children performed similarly to their Spanish-speaking dual-language programme peers on the measure of MC vocabulary. However, further analysis revealed that neither group was able to accurately interpret the meanings of MC words with low whole-word frequency and high stem frequency by extracting the stems or recognising the suffixes. In other words, neither group seemed to have achieved a level of Spanish morphological awareness that allowed them to efficiently analyse the structure of MC words. Findings from these researcher-developed measures provided additional insights into the vocabulary development of young second-language learners that were not available from previous research using standardised measures of vocabulary (e.g. Lindholm-Leary, 2005).

Results from the morpho-syntactic awareness measure showed that while the English-speaking children had a smaller vocabulary in Spanish, they were comparable to their Spanish-speaking peers in awareness of derivational morphology. It should be noted that the *Vocabulary and Morphological Awareness* measure and the *Morpho-syntactic* measure each captured a different facet of morphological awareness. The *Vocabulary and Morphological Awareness* measure primarily assesses a child's ability to utilise morphological knowledge to infer the meanings of MC words *in isolation*, which requires more explicit representations of the morphological structure and the meanings of the suffixes. Contrastingly, the morpho-syntactic measure taps more into the syntactic properties of morphemes, and the task may not

require an overtly explicit understanding of the morphological structure. For example, a child may correctly select *vullion* to fill in the blank in *She showed no – when she heard the news* without being able to articulate the reasoning for the selection (i.e. the syntactic property of the missing word and the suffix of the chosen word). Thus, the disparity in the findings from different measures of morphological awareness, which is itself an umbrella term, should not be viewed as being internally conflicting but, instead, as providing a more comprehensive understanding of these children's development of morphological awareness.

Cross-language transfer from English to Spanish in morphological and syntactic awareness was observed among both the English-speaking and Spanish-speaking children. With regard to morphological awareness, results from the *morpho-syntactic awareness* measure, which included different types of suffixes based on their cross-linguistic features, provided direct evidence that cross-language transfer plays a central role in the development of morphological awareness of young second-language learners. Both groups of children performed best on the type of derivational suffixes that share the same function and spelling in English and Spanish.

How do these young second-language learners differ from their monolingual English-speaking peers in the general education programme in vocabulary and morphological awareness in English?

Comparison of the development of English vocabulary and morpho-syntactic skills across the dual-language and the general education programmes showed that despite receiving less instruction in English, the English-speaking children in the dual-language programme not only performed on par with but also excelled over their monolingual peers in vocabulary and morpho-syntactic awareness. The English-speaking children in the dual-language programme performed similarly with their monolingual peers on those measures of morphologically simple vocabulary and all three morpho-syntactic measures. They outperformed the monolingual children on the measures of vocabulary that involved cognates and MC words. The findings suggested that children acquiring English and Spanish simultaneously benefited from the overlapping linguistic components between the two languages. These findings corroborated those from previous research with Spanish-speaking ELLs (e.g. Proctor & Mo, 2009) and further extended such bilingual advantage to English-speaking children who learnt Spanish as a second language. Furthermore, having access to another language may also allow children to more readily attend to the morphological and structural features of their native language. In line with the finding concerning the English-speaking children in the dual-language programme, the Spanish-speaking children, despite scoring significantly lower on the measures of morphologically simple vocabulary than English-speaking children in the general education programme, demonstrated more advanced development of morphological awareness and cognate vocabulary.

These findings provide important practical and theoretical implications. In terms of practice, the present study shows that English-speaking children from dual-language programmes can develop language and literacy skills in Spanish without sacrificing literacy skills in English, their native language. While the Spanish-speaking children lagged behind their English-speaking peers on morphologically simple vocabulary, their morphological and cognate awareness may expedite vocabulary learning and help close the achievement gap in the long run as MC and

Latin-based words become increasingly dominant in the vocabulary of middle grades students and beyond (Nagy & Anderson, 1998). In terms of theory, using measures that took into account the structural similarities and differences between the two languages, the present study was able to identify in which specific aspect of literacy development bilingual children have an advantage over their monolingual peers. Moreover, the present study provides more direct evidence for cross-language transfer and complements findings from existing research (e.g. Bialystok et al., 2005; Ramírez et al., 2013).

The present study provides further evidence suggesting that the effect of bilingualism on metalinguistic development can go beyond cross-language transfer. Findings from the morpho-syntactic awareness measures in both languages revealed that the bilingual children not only outperformed their monolingual peers on parallel suffixes that share the same function and spelling across the two languages, but also on suffixes that are unique and exist in only one of the two languages. Such advantage cannot be attributed solely to cross-language transfer. Instead, this suggests that through experience in two morphological and syntactic systems, bilingual children may become sensitive to more abstract principles of morphology and syntax, which benefit them in acquiring new suffixes and their syntactic properties. While more experimental research is needed, findings from the present study provide preliminary evidence supporting the structural sensitivity theory (Kuo & Anderson, 2010, 2012; Kuo & Kim, 2014).

The disparity in the development of morphological awareness in both languages from participants in the dual-language programme may appear puzzling at first sight: while both groups of participants demonstrated the ability to utilise morphological knowledge to infer the meanings of MC words *in isolation* in English, as evidenced in the superior performance of MC words over morphologically simple words matched on whole-word frequency, the same pattern was not observed in the parallel Spanish measure. The findings suggest that both groups of children showed more advanced morphological awareness in English than in Spanish. A possible explanation is that the participants for this study had more exposure to MC words in English than in Spanish because grade four math, sciences and social studies were taught in English, which are contexts in which MC words tend to appear more frequently (Nagy & Anderson, 1998).

Limitations and future directions

The present study has several limitations that warrant future research. First, the frequency of the target words in the vocabulary measure was retrieved from databases that include corpora of written texts for a wide range of readers. While previous research has also used word frequency information from the same databases to establish the relative difficulties of words in vocabulary assessments for school-aged children (Malabonga et al., 2008), it would be more appropriate if a database consisting of texts for school-aged children had been used because word usage may differ across texts for readers of different age groups.

Second, the comparability of the monolingual English-speaking participants and the English-speaking participants in the dual-language programme could have been more comprehensively established. The two groups of participants in the present study were comparable in SES and non-verbal IQ. The principals of both schools indicated that the bilingual programme was viewed positively as an enrichment

programme by the community, and there had always been a long waitlist for the English-speaking children to enrol in the dual-language programme. Nonetheless, because we did not ask the parents of each of the English-speaking participants in the general education programme whether they intended to enrol their children in the dual-language programme, we were unable to rule out the potential effect of parents' views on bilingualism on the observed group differences. The fact that group differences were observed only in some measures but not others suggests that the bilingual effect may be more prominent in some aspects of metalinguistic and literacy development than others. Since prior research has revealed a relationship between parental involvement and academic achievement (Fan & Chen, 2001), future research should include parental survey questions regarding parents' perceptions of bilingualism and their intent to enrol their children in the bilingual programmes.

Finally, caution should be taken in over-generalising the findings from the present study. Dual-language programmes may vary considerably in terms of curricular decisions, teacher qualifications and division of languages and model implementation. In our study, the schools used a 50/50 model where each class had about the same number of native-speaking children of each language, literacy was taught in both languages throughout the programme, and both languages were used equally as the language of instruction for all other subject areas. Future research should explore how metalinguistic awareness develops differently across programmes using different models.

One of the most important findings from the present study was that the English-speaking children in the dual-language programme, despite receiving less instruction in English, outperformed their monolingual peers in the general education programme on the ability to recognise the meanings of MC words. Our finding converges with prior findings from research on phonological awareness (e.g. Bialystok et al., 2005; Bruck & Genesee, 1995; Campbell & Sais, 1995; Chen et al., 2004; Kuo & Anderson, 2010, 2012), while extending these findings to morphological awareness, an aspect of metalinguistic awareness that becomes progressively more critical once children move beyond the initial phase of learning to reading. Future research should focus on disentangling the sources of such bilingual advantage in the development of morphological awareness. Experimental research that involves bilingual participants whose two languages share different degrees of typological affinity and uses researcher-developed measures will help to further clarify how cross-language transfer (Bialystok et al., 2005; Chen et al., 2004) and enhanced sensitivity to structural features of language (Kuo & Anderson, 2010, 2012) jointly contribute to the bilingual effect on the development of morphological awareness.

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