

Direct and Indirect Effects of Morphological Awareness on Reading Comprehension for Adolescent Spanish-English Emergent Bilinguals

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1. Introduction

There has been an increasing interest in the role of morphological awareness within reading comprehension over the last two decades. This interest stems from the idea that there has long been a strong relationship between vocabulary knowledge and reading comprehension in both first language (L1) reading and second language (L2) reading (Anderson & Freebody, 1981; Nagy & Anderson, 1984; Carlo, August et al., 2004; Carlo, August & Snow, 2005). In particular, having not just a breadth of vocabulary, i.e. knowledge of many different lexical items, but also a depth of vocabulary knowledge is beneficial to the developing reader. One important factor in depth of vocabulary knowledge is the ability to use morphological analysis. Since emergent bilinguals frequently start reading in the L2 with very low levels of L2 vocabulary, they need to employ any strategy available to accelerate vocabulary development.

Having an awareness of morphological structure and the ability to break down morphologically complex words into their constituent parts help readers assign meaning to new words they encounter in text (Anglin, Miller & Wakefield, 1993; Carlisle, 1995). While inflectional morphemes, e.g. those that represent agreement in person, number and gender, are contained in a finite set of affixes and generally mastered by the time children enter school, the English derivational morphological system is much more complex and is just beginning to be understood at the same time that the inflectional system is becoming mastered. Within the derivational system, affixes can be added to stems or base words, usually resulting in a new syntactic category. In the example (1) below the nominal suffix *ness* is added to the adjectival base word *happy*, which turns the final morphologically derived word *happiness* into a noun.

(1) *happy* (adj) + *ness* = *happiness* (noun)

While the Spanish inflectional system is richer than that of English, the derivational structures of Spanish and English are similar. See the identical construction in Spanish (2) below to that of the English example in (1).

(2) a. *feliz* (adj) + *idad* = *felicidad* (noun)
b. 'happy' + 'ness' = 'happiness'

Nagy and Anderson (1984) suggested that about 60% of new words learned in academic texts after 3rd grade are morphologically complex. Additionally, for every word learned, a reader might be able to figure out the meaning of one to three more words through morphological analysis. Example (2) shows a possible representation of this theory with the words *beauty* to *beautiful* to *beautify* and *beautification*.

(3) a. *beauty* (noun) + *ful* = *beautiful* (adj)
b. *beauty* (noun) + *ify* = *beautify* (verb)

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c. *beautify* (verb) + *(c)ation* = *beautification* (noun)

Despite many noble efforts by teachers in synonym drills, key word memorization, dictionary tasks and more, only about 10% of new vocabulary is acquired through direct instruction (Nagy & Anderson, 1984). Instead, readers must rely on context clues in text, syntactic structure of the sentence, and morphological strategies to learn the meanings of new words encountered in text (Anglin, Miller & Wakefield, 1993; Katz, 2004). Morpho-syntactic awareness, i.e. the ability to use both context clues and morphological information appears to be the strongest predictor of reading comprehension skills in L1 English (Katz, 2004).

There have been many studies showing this relationship between morphological awareness and reading comprehension to be true in English (Carlisle, 2000; Katz, 2004; Nagy, Berninger & Abbott, 2006; Kieffer & Lesaux, 2008). Furthermore, evidence from languages as diverse as English and Arabic, have suggested a developmental pattern within morphological awareness where as general reading competency develops so does morphological awareness. The research posits a sharp increase in morphological skills somewhere in the upper elementary grades, likely between 4th and 6th grades (Wysocki & Jenkins, 1987; Carlisle, 2000; Mahony, Singson & Mann, 2000; Nagy, Berninger et al., 2003; Nagy, Berninger & Abbott, 2006; Abu-Rabia, 2007).

Research specifically on morphological awareness in Spanish-English bilinguals has been varied. One study looked at the awareness of cognates between Spanish and English for children in 4th, 5th and 6th grades (Nagy, García, Durgunoglu & Hancin-Bhatt, 1993). They found that performance on English vocabulary tasks was higher when the student was able to recognize the English word as a Spanish cognate and knew the word in Spanish. All their participants had difficulty with the Spanish-English cognates that were least similar in orthographic representation, even when the phonology was closely related. This finding indicated that there was not a high awareness of cognate relationships between the two languages.

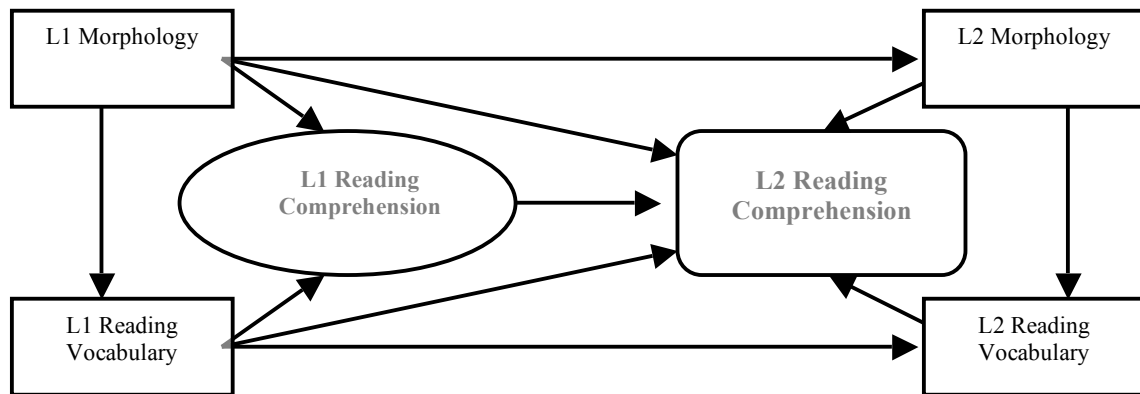
Another study examined the relationship between morphological awareness and reading in the L2 English only but not the cross-linguistic relationship from L1 Spanish to L2 English (Kieffer & Lesaux, 2008). They were able to show that L2 morphological awareness predicted L2 reading comprehension in 5th grade but not in 4th. This also confirmed the developmental shift from 4th to 5th grade in morphological awareness even in the L2.

The most comprehensive study on this bilingual population was done by Ramírez (2009), which did look at both the L1 and L2. Ramírez (2009) was focused on finding a unique contribution of morphological awareness to reading vocabulary in both Spanish and English as well as a unique contribution to reading comprehension in both Spanish and English and cross-linguistically. She used two measures of morphological awareness – a sensitivity task and a structure task. The sensitivity task measured morpho-syntactic awareness by having participants choose the correct morphologically derived word to fit a sentence. The structure task asked participants to either decompose or produce morphologically derived words to fit a sentence structure. Both tasks tapped into the morpho-syntactic properties of reading. She was able to show that morphology predicted both vocabulary and reading comprehension within-language (in both Spanish and English); but that L1 Spanish morphology did not make a significant unique contribution to either L2 English vocabulary or L2 reading comprehension.

What is new to the present study is that it compares a group of emergent bilinguals that are all at the same age and grade level but at different levels of proficiency in L1 reading. Unlike previous research on Spanish-speaking participants who had resided in the U.S., or another English-speaking country for a number of years (a minimum of 3+ years for Ramírez, 2009), the ones in the current study are all newcomers. In addition to the sensitivity and structure tasks administered by Ramírez (2009) this study also looks at two morphological awareness tasks that tap into the morpho-semantic properties of reading. In analysis, this study takes a path approach

to determining the effect of morphological awareness on reading comprehension. Instead of looking only at unique contribution of morphological awareness to reading comprehension beyond other variables, the multiple regression path analysis allows us to see the total effect of morphological awareness on reading comprehension in conjunction with the mediating variable(s). This study hypothesizes that there are a number of possible paths to L2 reading comprehension from various L1 reading abilities, namely L1 morphological awareness, L1 reading vocabulary and L1 reading comprehension to corresponding L2 reading abilities such as L2 morphological awareness, and L2 vocabulary. Figure 1 below is a model representation of the possible paths used in the analysis.

Figure 1. Theoretical Path for Morphological Awareness to Reading Comprehension



2. The Present Study

This study set out to determine both the direct and indirect effects of morphological awareness on reading comprehension in the L1 Spanish as well as in the L2 English and cross-linguistically. The specific research questions were the following: (1) What are the direct and/or indirect effects of morphological awareness in the L1 Spanish on L1 reading comprehension? (2) What are the direct and/or indirect effects of morphological awareness in L2 English on L2 reading comprehension? (3) What are the direct and/or indirect effects of a cross-linguistic relationship between morphological awareness in L1 Spanish and reading comprehension in L2 English? Is there a difference in that relationship for participants reading in L1 at 4th grade and below compared to those reading at 7th grade and above?

Based on previous research we had hypothesized that for (1) there would be a direct effect of morphological awareness in L1 Spanish on Spanish reading comprehension due to the similarity in structure of the Spanish and English derivational morphological systems. For (2) we also expected that there would be a direct effect of morphological awareness on reading comprehension in English because that has also been previously shown with L2 English learners (Kieffer & Lesaux, 2008). For (3) the hypothesis was that while there may be no indirect effect of L1 Spanish morphological awareness on L2 English morphological awareness, the total effect would be significant as mediating variables such as vocabulary and L1 reading comprehension would add to the total effect.

The participants in this study were 88 emergent bilinguals, who were newcomers in the New York City school system. All had arrived to the U.S. within 2 years of the study and were enrolled in 9th and 10th grades in one high school. The majority of them were 9th graders who had been in school in the U.S. for 2 months or less (63%); the remainder had been in the U.S. no longer than 14 months (36%). Their ages ranged from 15 to 20 years ($M = 17.43$, $SD = 1.17$; 50

males and 38 females). All were native Spanish speakers, mostly from the Dominican Republic (89%); the others were from Honduras, Ecuador, Mexico and Colombia.

The measures used for reading vocabulary and reading comprehension both came from the Academic Language and Literacy Diagnostic (ALLD). The ALLD is a tool that was developed by the Research Institute for Study of Language in Urban Society (RISLUS) in collaboration with the NYC Department Of Education and Pearson Publishers in order to determine native language reading proficiency for incoming emergent bilinguals. It's a cumulative assessment, spanning grade levels 2 to 11. It was administered in both Spanish and English¹. The reading vocabulary section includes three parts: multiple meanings, context clues and synonyms. Each of these subsections relate to the depth of vocabulary knowledge necessary for high-level reading skills. The reading comprehension section requires students to read a passage and answer a number of multiple-choice questions about it. The passages are either informational or functional and the questions range from requiring the reader to find basic information to more analytical, strategies and other higher-level text skills.

This study included four measures of morphological awareness: two on morpho-semantics and two focused on morpho-syntax. The morpho-semantic measures were: ALLD Word Study, and the Morphologically Relatedness Task (MRT). The morpho-syntax measures were the Test of Morphological Structure (TMS), and the Test of Syntactic Categories (SynCat). All morphological awareness measures were given in both Spanish and English.

Word Study is a subsection of the ALLD, which contains items that measure awareness of compound words and the ability to assign meaning to word parts, i.e. root, prefix and suffix morphemes. All Word Study items were on the 3rd grade level. The test included four compound words, two prefixes and two suffixes, making a total of eight items. Example (3) below measures ability to generalize the meaning of the er suffix.

(4) The er in teacher is the same as the er in ...” a) *helper*, b) *faster*, c) *bigger*.

In the MRT participants were given two words and asked if the second word “comes from” the first word, or if they were related in meaning. There were a total of 100 items; 56 were morphologically related and 44 were not. Examples (5) and (6) show a related and non-related example, respectively. This task was originally developed by Derwing (1976) and has been used in more recent studies on morphological awareness in reading (Mahony, 1994; Mahony, Singson & Mann, 2000). New items have been introduced in the present study and parallel version was also created in Spanish.

(5) *happy – happiness* (Related)

(6) *cat – category* (Non-related)

In the TMS participants were given a word and then asked to change the word to best fit the given sentence. Some sentences required the participant to produce a morphologically complex word from a base word, and others required the participant to break down a morphologically complex word into its base form. The test contained 12 items of production and 12 items of decomposition of morphologically complex words. Example (7) shows production while example (8) shows decomposition. Some items in this task were taken from Carlisle (2000) who developed the task along with some Spanish items taken from Ramírez's sensitivity task (2009).

¹ The Spanish items were adapted from Pearson's standardized test, Aprenda third edition, and the English items were adapted from the Stanford, tenth edition.

- (7) *Success*. The woman's career was very [*successful*]. (Production)
(8) *Originality*. That painting is the [*original*]. (Decomposition)

In the final morphological task, SynCat, the participants were given a sentence with a word missing. They were then given four word choices to fill in the blank in the sentences. The test was made up of 24 items of real word morphologically complex items and 10 nonsense word items, constructed by adding a real morphological affix to a nonsense stem. Examples (9) and (10) demonstrate the real word and nonsense items, respectively. The items in the present study were adapted from two previous ones that used this measure in Spanish and English (Mahony, 1994 and Ramírez, 2009).

- (9) His _____ changed as he got older. a) *personify* b) *personal* c) ***personality*** d) *personalize*
(10) Every living thing has its own _____. a) ***torbature*** b) *torbativize* c) *torbatable* d) *torbatify*

The data were collected by research assistants who had been trained and certified on administering each of the assessments. Data collection occurred on two school days. The first day was for data collection in Spanish, the second day in English². Each test section was administered in one session to a group of approximately 15-20 students per classroom. These sessions included the test sections: 1) ALLD Vocabulary and Word Study, 2) ALLD Reading Comprehension, and 3) Morphological Awareness tasks. Bilingual research assistants, fluent in Spanish, administered the Spanish tests.

3. Results

Due to the limited time spent acquiring English and short amount of time in the U.S. at the time of the study, the participants performed much better on the morphological awareness tasks in the L1 Spanish ($N = 78$; $M = 79$; $SD = 11$) than in the L2 English ($N = 70$; $M = 53$; $SD = 13$). The TMS task in English, in fact, proved to be too difficult for the majority of the participants. This task required the participants to write in a response to the prompts, either decomposing a morphologically complex word into its base form or producing a morphologically complex word from its given stem. Since 17 out of 70 participants (24%) left these items blank on the assessment, the analysis for English morphology in the following results does not include the TMS measure. Therefore, the English morphology block in the following multiple regression path analyses includes the three other morphological awareness tasks: ALLD Word Study, MRT and SynCat both real and nonce.

The results for research question (1) on the effect of morphological awareness in L1 Spanish on L1 reading comprehension are illustrated in Table 1 below. A mean score for all four morphological tasks was used as the measure of L1 morphology. There were two possible paths from L1 morphology to L1 reading comprehension: either direct or indirect through L1 vocabulary. Both the direct effect and total effect were significant for morphology to reading comprehension in Spanish. There was no significant contribution of L1 vocabulary to L1 reading comprehension in this model.

² A third day of data collection was also used for administration of individual assessments that were part of a larger study done through RISLUS and the CUNY Graduate Center.

Table 1. Standardized Direct, Indirect, and Total Effects of Reading Variables Within-Language on L1 Spanish Reading Comprehension ($N = 78$)

VARIABLE	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
L1 Morphology	.530**	.065	.595***
L1 Vocabulary	.092	--	.092

*** β coefficients are significant at the .001 level, ** significant at the .01 level, * significant at the .05 level and ~ approaching significance at the .1 level. $n = 24$ low-level L1 proficiency (2nd – 4th grade), $n = 28$ mid-level L1 proficiency (5th – 6th grade) and $n = 26$ high-level L1 proficiency (7th – 11th grade).

For research question (2) there was a significant direct effect and stronger total effect of L2 morphological awareness on reading comprehension in L2 English. The results of the L2 morphological awareness to reading comprehension in L2 are indicated in Table 2 below. Like the within-language results for Spanish, there was no significant contribution of L2 vocabulary to L2 reading comprehension.

Table 2. Standardized Direct, Indirect, and Total Effects of Reading Variables Within-Language on L2 English Reading Comprehension ($N = 70$)

VARIABLE	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
L2 Morphology	.410**	.119	.529***
L2 Vocabulary	.185	--	.185

*** β coefficients are significant at the .001 level, ** significant at the .01 level, * significant at the .05 level and ~ approaching significance at the .1 level. $n = 20$ low-level L1 proficiency (2nd – 4th grade), $n = 26$ mid-level L1 proficiency (5th – 6th grade) and $n = 24$ high-level L1 proficiency (7th – 11th grade).

Research question (3) was aimed at finding any cross-linguistic relationships on the path from L1 morphology to L2 reading comprehension. There were a number of possible paths from L1 morphology to L2 reading comprehension, one direct and six indirect:

1. L1 morphology \rightarrow L2 reading comprehension
2. L1 morphology \rightarrow L1 reading comprehension \rightarrow L2 reading comprehension
3. L1 morphology \rightarrow L1 vocabulary \rightarrow L1 reading comprehension \rightarrow L2 reading comprehension
4. L1 morphology \rightarrow L1 vocabulary \rightarrow L2 reading comprehension
5. L1 morphology \rightarrow L1 vocabulary \rightarrow L2 vocabulary \rightarrow L2 reading comprehension
6. L1 morphology \rightarrow L2 morphology \rightarrow L2 reading comprehension
7. L1 morphology \rightarrow L2 morphology \rightarrow L2 vocabulary \rightarrow L2 reading comprehension

In order to consider each path, L2 reading comprehension was regressed on each variable so that the direct, indirect and total effects could be calculated for each. The results are shown in Table 3 below.

Table 3. Standardized Direct, Indirect, and Total Effects of Cross-Language Reading Variables on L2 English Reading Comprehension ($N = 60$)

VARIABLE	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
L1 Morphology	.139	.282	.421***
L1 Reading Vocabulary	-.166	.180	.014
L1 Reading Comprehension	.218	.100	.318*
L2 Morphology	.331~	.094	.425**
L2 Reading Vocabulary	.152	--	.152

*** β coefficients are significant at the .001 level, ** significant at the .01 level, * significant at the .05 level and ~ approaching significance at the .1 level. $n = 18$ low-level L1 proficiency (2nd – 4th grade), $n = 20$ mid-level L1 proficiency (5th – 6th grade) and $n = 22$ high-level L1 proficiency (7th – 11th grade).

While there were no significant direct or indirect effects in the cross-linguistic model, there were a number of variables that had a significant total effect on L2 reading comprehension. The path model for the whole group suggests that there are some cross-linguistic predictors of L2 reading comprehension, namely L1 morphology and L1 reading comprehension. Though L1 morphology has only a small and insignificant direct effect on L2 reading comprehension, the total effect is strong. As expected L1 reading comprehension makes significant contribution in total effect on L2 reading comprehension. L2 morphology also has a strong effect on L2 reading comprehension.

The second part of research question (3) was to examine the difference between a low group (2nd – 4th grade) of L1 readers and a high group (7th – 11th grade) of L1 readers on the multiple regression path from L1 morphology to L2 reading comprehension. L1 reading proficiency was determined by their performance on the ALLD reading comprehension section in L1 Spanish.

Before putting all of the variables into the cross-linguistic model for each proficiency group, the relationship between morphology and reading comprehension was analyzed within-language to determine any underlying differences. The results in the L1 Spanish for the low proficiency group ($n = 24$), showed that the total effect $\beta = .466$, $p < .05$ and direct effect of morphology $\beta = .489$, $p < .05$ were both significant contributors to L1 Spanish reading comprehension. Neither morphology nor vocabulary made any significant contributions for the high group ($n = 26$).

Within the L2 English only: for the low group ($n = 20$), the direct effect of morphology approaches significance $\beta = .468$, $p < .1$. For the high group ($n = 24$), both the direct effect $\beta = .499$, $p < .05$ and total effect $\beta = .645$, $p < .001$ of L2 morphology were significant contributors of L2 English reading comprehension. The within-language results showed that morphology only made a significant contribution to reading comprehension in Spanish for those reading at or below 4th grade level. In English, morphology was only a significant predictor of reading comprehension for the high group, those reading at or above 7th grade level in L1. The mean grade level for the high group in English was 3.9, or almost 4th grade level.

Out of the 60 participants that completed all of the tasks for cross-linguistic comparison, 18 were in the low group and 22 were in the high group. Participants in the low group were reading between 2nd and 4th grade level in L1, with a mean grade level of 2.8 ($SD = .94$). The high group participants were reading between 7th and 11th grade level in L1 with a mean grade level of 8.7 ($SD = 1.55$). A t-test revealed that there was a significant difference in L1 reading comprehension between the low ($M = 36$, $SD = 13$) and high groups ($M = 69$; $SD = 9$); $t(38) = 1.112$, $p = .000$.

Separate multiple regression models were analyzed for the low group and high groups on the cross-linguistic predictors of L2 reading comprehension. The regression model was not significant at any step for the low group. For the high group, both L1 morphology and L2 morphology had significant total effects on L2 reading comprehension. There was no significant contribution of L1 reading comprehension to L2 reading comprehension for this high group.

Table (4) below shows the direct, indirect and total effects of L1 and L2 morphology on L2 English reading comprehension for the high L1 reading proficiency group.

Table 4. Standardized Direct, Indirect, and Total Effects of Cross-Language Reading Variables on L2 English Reading Comprehension for the high group L1 Grade Level Proficiency 7th-11th ($n = 22$)

VARIABLE	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
L1 Morphology	.591~	-.151	.440*
L2 Morphology	.464~	.135	.599*

*** β coefficients are significant at the .001 level, ** significant at the .01 level, * significant at the .05 level and ~ approaching significance at the .1 level.

4. Discussion

For research question (1) the results confirmed the prediction that there would be both a direct effect and total effect of morphology on reading comprehension in L1. This result suggests that the derivational systems of Spanish and English are similar enough to yield the same effect of morphology on reading comprehension for L1 Spanish speakers and L1 English speakers. This also is consistent with Ramírez's finding that morphology made a significant contribution to reading comprehension in the L1 Spanish. While Ramírez was able to show this relationship for 4th graders and 7th graders, this research showed that it was also evident in adolescent readers at a range of proficiency levels (i.e. from 2nd to 11th grade in L1). One unexpected result was that the Spanish reading vocabulary measure used in this study only made a small contribution to the indirect effect of morphological awareness path to reading comprehension and no unique contribution directly to reading comprehension in Spanish. One explanation could be that this particular ALLD vocabulary assessment was not a reliable measure in predicting reading comprehension. Possibly, this is due to the fact that the participants mean scores on the vocabulary assessment ($M = 63$; $SD = 15$) were much higher than their scores on the reading comprehension section ($M = 51$; $SD = 16$) and that those in the highest reading proficiency group were too close to ceiling on the vocabulary assessment.

When looking at the low and high proficiency readers as separate groups, the effect was only significant for the low group (2nd – 4th grade level) of L1 Spanish morphology on L1 Spanish reading comprehension. In this participant subset the mean L1 grade-level for the low group was 2.8 ($n = 24$; $SD = .94$). There was no significant effect of morphology on reading comprehension for the high group who was reading at a much higher grade-level in Spanish ($n = 26$; $M = 8.6$; $SD = 1.6$). This suggests that it was the lower proficiency readers that were driving the strong effect of morphology on reading comprehension for the whole group ($N = 78$). This finding is in contrast to that of the earlier studies on L1 English readers. The consensus from several studies in L1 English was that the strength of the relationship between morphological awareness and reading comprehension got much stronger as the reading comprehension proficiency, and age of the participants, increased past 4th grade (see Carlisle, 2000; Katz, 2004). One possible explanation for the contribution of morphology to reading comprehension at the earlier stage in Spanish than English is due to the differences in inflectional morphological structure between the two languages. Since Spanish makes use of many more inflectional distinctions (e.g. person, number and gender agreement) than English does, the L1 Spanish younger readers may be attuned to morphological distinctions (whether inflectional or derivational) sooner than L1 English readers. The L1 English readers are just beginning to develop this skill at 3rd grade when they need to pay attention to such complex morphological changes in words they encounter in

texts at and above 3rd grade level. A similar explanation was proposed by Ramírez, Chen, et al. (2009) when they found that L1 Spanish morphological awareness contributed to L2 English word reading above and beyond L2 English morphological awareness. The heightened sensitivity that Spanish-speakers have to morphological complexity could be the contributing factor also here for the younger readers as the inflectional and derivational systems of Spanish are intertwined (Ramírez, Chen, et al., 2009). It could be that the relationship between morphological awareness and reading comprehension in Spanish grows weaker at a certain point (e.g. between 4th – 6th grade) while other subskills of reading become more important; this would explain why morphological awareness did not predict reading comprehension for the high-level readers. Replication of this measure would prove useful in confirming these suppositions.

For research question (2) we hypothesized that there would be both a direct and total effect of morphological awareness on reading comprehension in the L2 English. The results confirmed our hypothesis for this group of emergent bilinguals. The mean reading grade level of the entire group in English was only 2.8 ($SD = 1.7$), yet the morphological awareness tasks did have a significant effect on L2 English reading comprehension. In this L2 within-language analysis, the effect of morphology on reading comprehension was only significant for the high group who had a mean grade-level score of 3.9 in English reading comprehension ($SD = 2.3$). In this case it was the higher proficiency group that seemed to be activating their morphological skills to contribute to their overall L2 reading comprehension ability. We might posit that the low group's ability in English was just too low to make significant use of the L2 morphological awareness to contribute at all to the English reading. The high group was still reading at a level low enough in English (i.e. below 4th grade) that they were still relying on word study skills such as morphological generalization and recognition of cognates. This explanation would also be in line with the reasoning for research question (1) where the morphological awareness only predicted reading comprehension for the lower-level readers.

The hypothesis for research question (3) was that while there might not be a direct effect of L1 morphological awareness on reading comprehension in the L2, there would be multiple variables on the path that would help strengthen the total effect of Spanish morphology on English reading comprehension. The results showed that the hypothesis turned out to be true for L1 morphological awareness did intersect with and make use of many of the mediating variables on the path to L2 reading comprehension escalating the total effect. What was not expected was that L1 morphological awareness would have such a strong total effect on L2 reading comprehension that it would be stronger than that of both L1 vocabulary and L1 reading comprehension especially given the long-standing evidence that L1 reading comprehension predicts L2 reading comprehension (see August & Shanahan, 2006; Van Gelderen et al., 2007). In fact, the only other variable that had as strong an effect on L2 reading comprehension was L2 morphology. Though unexpected that the cross-linguistic results would turn out in favor so strongly of morphological awareness for this entire group, it is nonetheless a promising result. These results have no doubt provided incentive to further investigate the interaction between morphology and other subskills associated with reading.

The final result in research question (3) was the cross-linguistic relationship seen between L1 morphology and L2 reading comprehension in only the high group of readers and not in the low group. These data can be explained in the same way as the results for the L2 English within-language results. The high group of Spanish-English emergent bilinguals, reading at a mean grade level below 4th grade in English, are relying on basic morphological skills to comprehend what they are reading in English. There is a strong correlation between their performance on the L1 morphological awareness and L2 morphological awareness tasks ($r = .636$; $p = .001$), which might be what is making the total effect of both morphological awareness measures so strong on L2 reading comprehension.

5. Conclusion and Future Directions

The research set out to determine (1) the effect of L1 morphological awareness on L1 reading comprehension in Spanish, (2) the effect of L2 morphological awareness on L2 reading comprehension in English and (3) the cross-linguistic effect of L1 morphological awareness on L2 reading comprehension. The multiple regression path analyses of our data set revealed that in each of these cases, morphological awareness did have a strong total effect on reading comprehension. In each case, the total effect was mediated by reading vocabulary, even though vocabulary on its own did not have an effect on reading comprehension in this study. In the cross-linguistic analysis it seemed that there were several mediating variables from L1 morphology to L2 reading comprehension which all contributed to the strong total effect.

There are several areas in which this research could be developed in the future. The first thing would be to measure reading vocabulary with a different assessment. The surprising result in this study was that reading vocabulary did not make any independent contributions to either L1 reading comprehension or L2 reading comprehension beyond that of morphology. Different measures of reading vocabulary, such as a definition task developed by Anglin, Miller & Wakefield (1993), might give a more accurate understanding of the role of reading vocabulary.

Another area of further exploration would be into other linguistic variables that might act as mediators in the relationship between morphology and other reading skills such as vocabulary and reading comprehension. Previous studies have shown that there can be an effect from phonological transparency in the morphological structure on morphological awareness (Leong, 1989; Fowler & Liberman, 1995; Mahony, Singson & Mann, 2000), and that the frequency of both the base word and the derivational affixes may play a role in the relationship as well (Katz, 2004). Example (11) below shows how the shift in phonological representation might impede some readers' ability to recognize a morphological relationship between the two words *sign* and *signature*.

(11) *sign* (silent “g” – noun) + *(a)ture* = *signature* ([g] is produced – noun)

Furthermore, research has shown that more productive morphemes are learned at an early stage of reading than those that are infrequent and less productive (Anglin, Miller & Wakefield, 1993). Highly productive, frequent morphemes such as the agentive *-er* in *teacher* are learned as early as age 4 in typically developing English speakers. According to Anglin, et al. (1993), less productive morphemes such as the adjectival suffix *-ous* in the example (12) below are acquired much later in the elementary years.

(12) *continue* (verb) + *ous* = *continuous* (adj)

The role of cognates is also an important avenue to further explore. In most reading studies to date (e.g. Nagy, García, et al., 1993) cognates have been defined as words from one language that have an obvious orthographic similarity, similar phonological structure and closely related meanings to words in another language. Many young readers do not have an awareness of these cognates, however, older, more proficient readers do appear to make use cognate relationships. An interesting approach would be to compare performance on morphological tasks as well as reading vocabulary while controlling for the number of cognates that exist in each of the measures. Findings might reveal a difference in performance on the items containing cognates and those with non-cognates. This would also allow us to see at what point in the developmental

stages of morphological awareness does cognate recognition become stronger. Is it around the same level of increasing skills as general morphological awareness between 4th and 6th grades?

Lastly, since this research looked at participants performing at different levels of L1 reading comprehension proficiency that were all the same age it would be interesting to compare how readers of the same proficiencies but at different ages would perform. For example, the low reading group in this study were all adolescents reading between 2nd and 4th grade level in Spanish. If these participants were paired with perhaps a 3rd grade bilingual cohort who were reading about on grade level in L1 Spanish (i.e. between 2nd to 4th grade), we would be able to determine if the differences between the low L1 group and high L1 group were due to biological age and/or due to reading ability. One might find that since complex morphologically derived words are mostly found in academic language, not oral language, that there is no difference between biological age and reading proficiency groups.

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