The Effect Of Morphological Awareness On Reading Comprehension: A Study With Adolescent Spanish-English Emergent Bilinguals

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THE EFFECT OF MORPHOLOGICAL AWARENESS ON READING COMPREHENSION:
A STUDY WITH ADOLESCENT SPANISH-ENGLISH EMERGENT BILINGUALS

by

REBECCA CURINGA

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THE CITY UNIVERSITY OF NEW YORK
Abstract

THE EFFECT OF MORPHOLOGICAL AWARENESS ON READING COMPREHENSION: A STUDY WITH ADOLESCENT SPANISH-ENGLISH EMERGENT BILINGUALS

by

Rebecca Curinga

Adviser: Professor Elaine C. Klein

The present research examines the role of morphological awareness in reading comprehension of high school emergent bilinguals. As an increasing number of research studies contribute to our understanding of morphological awareness, i.e. the ability to reflect on and manipulate morphologically complex derived words, we are better able to appreciate some essential components of reading that may have been overlooked in past decades. Previous research suggests that morphological awareness contributes to academic reading vocabulary and higher-level text comprehension, both crucial to the success of secondary school students in the United States (U.S.).

The population in the present study is newcomer Spanish-speaking high school students who have a range of reading ability in the first language (L1), and have emerging second language (L2) English and literacy skills. There are two overarching research questions in this study: the first considers the role of linguistic variables, namely Spanish-English cognates, the frequency of morphologically complex derived words, the degree of phonological transparency in morphologically related words, and the linguistic context: semantic or syntactic. The second examines the effect of morphological awareness on reading comprehension in the L1 Spanish, in the L2 English, and across these languages. The effect of morphological awareness on reading comprehension is considered through reading vocabulary as a mediating variable, and analyzed with a series of multiple regression path analyses. Both questions consider differences between L1 Spanish low-proficiency (second – fourth grade) and high-proficiency (seventh – eleventh grade) readers.
Several important contributions come from this study. The first is that linguistic variables do have a significant effect on morphological awareness, with strongest effects from cognates and frequency in English. Second, morphological awareness makes a strong contribution to reading comprehension in both the L1 Spanish and L2 English; and the shared contribution of morphological awareness and reading vocabulary of these two predictors together is strongest. Furthermore, L1 morphological awareness contributes to L2 reading comprehension for those who are reading above the third grade proficiency in English. Implications from this research suggest that higher morphological awareness skills in L1 Spanish helps to foster L2 English vocabulary and reading comprehension skills.
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1. Introduction

1.1. Rationale for the Present Study

Numerous adolescent emergent bilinguals come to schools in the United States (U.S.) from other countries with resilience, perseverance and the motivation to succeed. Upon entering our schools, these newly arrived students bring their personal experiences, knowledge of their home languages and their personal abilities. They often have high aspirations to secure professional jobs, go to college and provide for their families (Klein & Martohardjono, 2006). In order to achieve these goals, they must negotiate life in an unfamiliar place, and compete with academic rigors such as high-stakes standardized tests, advanced-level homework assignments requiring academic language, all while acquiring English and gaining new content knowledge through second language instruction (Menken, 2013). They are in fact performing double the work than their English-speaking peers by taking on academic language and content knowledge while acquiring a new linguistic system at the same time (Ruiz-de-Velasco & Fix, 2000; Short & Fitzsimmons, 2007). Moreover, many of these same students come with limited literacy skills in their home languages, and are underserved by secondary schools where most teachers are not equipped to teach foundational literacy skills usually relegated to elementary school instruction (Short & Boyson, 2012).

Many previous researchers have portrayed emergent bilingual students with a deficit model, starting with the viewpoint that these students lack English skills and academic preparedness to succeed in U.S. schools, rather than concentrating on their strengths (Menken, 2013). For instance, many common terms used to identify this population, such as English Language Learner (ELL), Language Minority (LM) and Limited English Proficient (LEP), perpetuate the deficit model in their nomenclature, suggesting that languages other than English are devalued in the eyes of the educational system. In this study, I attempt to

---

1 Even students enrolled in bilingual programs (e.g. transitional bilingual programs) spend a portion of their day immersed in English instruction.
demonstrate that even the lowest level readers\(^2\) have valuable skills in their first language, Spanish, that if developed have the potential to significantly boost the growth of their English language and literacy skills. This positive perspective puts an emphasis on skills the students bring rather than what they lack. I therefore have chosen to use a more inclusive term throughout this paper, i.e. *emergent bilingual*. As García, Kleifgen & Falchi (2008) suggest, the term signifies that this group is indeed emerging as true bilinguals, and recognizes both the need to maintain the home language while the English language is added in the academic context.

The goal of the current study is to investigate one aspect of how to enable these students to succeed in school, bearing in mind that there is a strong relationship between academic success and literacy. In particular, this dissertation provides insight into the value of first language reading skills while acquiring English language and literacy in a high school context. While there are many components within the complex reading process, reading comprehension has been chosen as the focal point or end goal of the current study because it is this higher-level cognitive skill that is so critical to success in secondary schools (e.g. Short & Boyson, 2012). Researchers add that while emergent bilinguals often master other beginning-level reading skills, such as phonemic awareness and decoding, reading comprehension remains underdeveloped, further widening the gap between native English speakers and emergent bilinguals in U.S. schools (August & Shanahan, 2006; Short & Fitzsimmons, 2007).

In order to close this gap between English speakers and emergent bilinguals much of the focus of current research is on how to develop vocabulary knowledge in English (see Graves, August & Mancilla-Martinez, 2013). In the present research, I attempt to locate answers to the question on how vocabulary knowledge is strengthened through word study skills in both the first language, Spanish, and the second language, English. In other words, an awareness and

\(^2\) Some of the low-level readers identified in this study are part of a sub-group of emergent bilinguals in New York City (NYC) known as Students with Interrupted Formal Education (SIFE). NY State defines SIFE as having entered school at a level higher than 2\(^{nd}\) grade, missed 2+ years of formal schooling, exhibiting 2+ years below grade level proficiency in reading and math and possibly being pre-literate in their home language.
ability to break down words, or the development of morphological awareness, may prove crucial for speeding up vocabulary acquisition in the second language.

1.2. What is Morphological Awareness?

Research suggests that the ability to recognize morphological word families like nation, national, nationalize and nationalization can be an asset when reading (see, for example, Graves et al., 2013). In a seminal study on printed words in grade school English, Nagy and Anderson (1984) found that 60% of words encountered in texts above third grade level were complex morphologically derived words for which the meaning could be figured out through a process of breaking down the words into their morphemic parts. Theoretically, a relational awareness of morphologically complex words can lead to both breadth and depth in vocabulary knowledge. For example, one aspect of depth of vocabulary knowledge is the ability to identify all morphemes in the word. Both nation and national have a higher frequency in English than nationalize and nationalization, whereas the latter two examples would most likely only be found in text, rather than in oral language. Therefore, the ability to break down the word nationalization into its individual morphemes, including the base noun nation + the adjectival suffix –al + the verbal suffix –ize + the nominal suffix –tion, and assigning meaning to the smaller parts, could help to bring forth comprehension of the whole word. Breadth of vocabulary can also be extended in this same process. For example, meaning can be assigned to a novel lower frequency complex word encountered in text, such as beautification, by recognizing the nominal suffix -(ca)tion. Once the suffix is separated from the rest of the remaining word, beautifi-, two other higher frequency morphologically related words can be identified, i.e. beautiful and beauty and used to assign meaning to the new word.

In the two decades since Nagy and Anderson’s study (1984), many more researchers have weighed in on the merits of morphological awareness in vocabulary development and reading comprehension, with a heavy focus on native English speaking children and young adolescents of middle school age. There is a dearth of research on morphological awareness in
secondary school adolescents and post-school-age adults. The next section will address what research has shown us about the relationship between morphological awareness, vocabulary and reading comprehension, and what gaps remain in understanding the role of morphological awareness for emergent bilinguals.

1.3. Why is morphological awareness important for vocabulary development and reading comprehension?

Studies in first language (L1) and a growing number in second language (L2) have shown that morphological awareness correlates independently with many different components of reading: phonological awareness and decoding or word reading (Mahony, Singson & Mann, 2000; Nagy, Berninger & Abbott, 2006), vocabulary (Anglin, 1993; Carlisle, 2000; Nagy et al., 2006; Wysocki & Jenkins, 1987) and reading comprehension (Carlisle, 2000; Goodwin, Huggins, Carlo, August & Calderon, 2012; Katz, 2004; Kieffer & Lesaux, 2008; Ku & Anderson, 2003; Nagy, Berninger, Abbott, Vaugh & Vermeulen, 2003; Nagy et al., 2006; Tighe & Binder, 2013). Reading vocabulary has been established as highly correlated with reading comprehension in L1 (e.g. Anderson & Freebody, 1981; Beck, McKeown & Omanson, 1987; Nagy & Anderson, 1984; Wagner, Muse & Tannenbaum, 2007), and L2 vocabulary has often been said to be the most significant predictor of L2 reading comprehension (see Garrison-Fletcher, 2012; Graves, August & Mancilla-Martinez, 2013). Furthermore, while phonological skills become less important for reading comprehension as readers become more skilled (see Scarborough, Ehri, Olson & Fowler, 1998), it seems that morphological awareness continues developing throughout the high school years and beyond while the correlation with reading comprehension also grows stronger as morphological abilities are increased (e.g. Nagy et al., 2006).

In section 1.2 (above) I noted that there is an absence of research on morphological abilities of secondary school students. Furthermore, while there have been many studies investigating the role of morphological awareness for native English speakers and some that have done so in English as a second language, there is still much to learn on what contributes to
morphological awareness in the L2. In other words, there are only a handful of studies that have looked at the cross-linguistic contributions of morphological awareness to reading comprehension in English (see, for example, Schiff & Calif, 2007; Wang, Cheng & Chen, 2006). Only one study, to my knowledge, has specifically considered the role of Spanish morphological awareness in English reading comprehension (Ramírez, Chen & Pasquerella, 2013) in a bilingual population. More on the cross-linguistic relationships of morphological awareness and reading is discussed in the following section, which outlines the purpose of the present study.

1.4. The Purpose of the Present Study

The present study adds to the literature the importance of morphological awareness in the L1 and L2 for secondary school emergent bilinguals, including some that have low-level and some with grade appropriate literacy skills in their L1 Spanish. The students in this study were all in ninth and tenth grades in one high school and exhibited a range of literacy skills from almost preliterate (i.e. just below second grade proficiency level) to above grade level (i.e. eleventh grade proficiency) in their home language, Spanish. The range of ability in the students depicted in this study are representative of emergent bilingual populations across the U.S., and portray the challenges educators face in differentiating instruction for this population. The current research is specifically concerned with understanding how to build depth of vocabulary knowledge in adolescent Spanish-English emergent bilinguals, and in turn both advance breadth of vocabulary knowledge and contribute to an overall increase in reading comprehension for the full range of students’ proficiency levels.

The specific research questions in the current study are twofold: one is to determine the role of linguistic variables in morphological awareness, specifically Spanish-English cognates, the frequency of morphologically complex derived words and the degree of phonological transparency in morphologically related words. These variables were selected because previous studies proposed them to have either a positive effect (cognates) or negative effect (low
frequency and phonologically opaque complex words) on performance in morphological tasks. The second question of the study examines the effect of morphological awareness on reading comprehension in the L1 Spanish, and in the L2 English. For the second question, I consider the effect of morphological awareness through reading vocabulary as a mediating variable, as well as the direct contribution of morphological awareness to reading comprehension through a series of multiple regression path analyses. Because all of the morphological awareness and reading measurements were given both in Spanish and English, I look across languages to determine whether Spanish morphological awareness contributes to English reading comprehension. Instead of reporting on the unique contribution of morphological awareness to reading comprehension above and beyond other variables, I choose to present the relationship among the variables in a regression path analysis which takes into account the total effect that morphological awareness and reading vocabulary contribute together to reading comprehension. This path analysis recognizes that sub-skills of reading do not exist in isolation, and that they are strongest when considered together.

The previous research studies that have shown cross-linguistic relationships between morphological awareness and reading skills have been in varied languages (e.g. Chinese, Arabic, Hebrew, and Spanish), assuming different methodologies and with mixed results, sometimes due to differences in morphological structure between the languages examined (Hancin-Bhatt & Nagy, 1994; McBride-Chang, Shu, Wai Ng, Meng & Penney, 2007; Nagy, García, Durgunoglu & Hancin-Bhatt, 1993; Ramírez, Chen, Geva & Kiefer, 2010; Ramírez et al., 2013; Saiegh-Haddad & Geva, 2008; Schiff & Calif, 2007; Wang et al., 2006; Zhang & Koda, 2011). In the present study there are many opportunities for cross-linguistic transfer because there is similarity in morphological structure in Spanish and English, including the fact that many words share etymology in Latin roots and derivational affixes from Latin and Greek.

The current study contrasts with the only other study that has looked at the contribution of Spanish morphological awareness to English reading comprehension (Ramírez et al., 2013) in
that her population includes bilingual children in fourth and seventh grades who had been immersed in an English-speaking country for a minimum of three years, while the present study is concerned with older newcomer students, ninth and tenth grade emergent bilinguals. The present study compares readers who fit into two proficiency groups, second to fourth grade level and seventh to eleventh grade level in their L1 Spanish reading. Therefore, while the proficiency level of the participants is more or less the same in the two studies, both the age and amount of exposure to the L2 English is not. Comparing and contrasting the two studies will help to 1- confirm that Spanish morphological awareness does significantly contribute to English reading comprehension and 2- determine if morphological awareness is more closely matched with the age of the participants or with their reading proficiency level.

1.5. The Chapters of this Dissertation

This dissertation is divided into eight chapters, each of which is outlined below. Chapter 2: Review of the Literature – This chapter is comprised of a literature review which begins by exploring the development of reading in a first language, the process of vocabulary development and the impact of vocabulary on reading comprehension. Next, I compare the morpho-phonological structures of Spanish and English and give examples of similarities and differences in word formation processes in the two languages. I then give an overview of the three linguistic variables, cognates, frequency of morphologically derived words and levels phonological transparency, and discuss how each is related to morphological awareness. Next, I look at the developmental patterns within morphological awareness and discuss how they relate to the population in the current study. I then review studies on morphological awareness in the L1 and how they show relationships of morphological awareness to different components of reading. An overview of L2 reading and vocabulary processes comes next. The chapter ends with a review of studies in morphological awareness and reading comprehension done in the L2 English, and
then finally examines the few studies that have been done cross-linguistically. The chapter ends with a summary of the literature, and illuminates the gaps that still need to be filled.

Chapter 3: Pilot Study: Morphological Awareness in Reading for Low-Literacy Adolescent Newcomers – In this chapter, I review a pilot study that I conducted prior to the start of this dissertation. The study included participants that were all low-literacy emergent bilingual adolescents. I looked at the unique contribution of morphological awareness in Spanish to that of English reading comprehension, using a facilitating variable of morphologically derived reading vocabulary. This chapter ends with a synthesis of the research including questions answered from the pilot study by proposing a theoretical model of the cross-linguistic relationship of morphological awareness and reading comprehension.

Chapter 4: Research Questions and Hypotheses – This chapter presents the two overarching research questions on the role of linguistic variables in morphological awareness, and the effect of morphological awareness on reading comprehension. Each research question is broken into four sub-questions that include analyses of the issue in the L1, L2, cross-linguistic relationships and differences for low and high readers. Hypotheses are presented for each sub-question.

Chapter 5: Methodology – This chapter provides the details on the participants, materials, procedures and data analyses used for the current study. The materials include three control measures, two reading measures (reading vocabulary and reading comprehension) and four morphological awareness measures (two that tap into semantic contexts of morphological awareness and two that tap into syntactic environments). Example items accompany each morphological awareness test description.

Chapter 6: Results – In this section, I offer results to the statistical measures used to analyze the research questions. The results on the control measures are presented first, then the results for the first research question on the role of linguistic variables in morphological
awareness, and finally the results on the effect of morphological awareness on reading comprehension.

Chapter 7: Discussion – This chapter provides an interpretation of the results that are presented in Chapter 6. It is divided into two general sections by the two larger research questions of the present study.

Chapter 8: Conclusions – In the last chapter I offer a summary of the current study and conclusions with insights into the role of the L1 in L2 reading comprehension through the lens of morphological awareness. I present some implications for educators and practitioners, and suggest some avenues for further research.
2. Review of the Literature

In this chapter I will review the literature relevant to the field of morphological awareness and its relationship to reading. First I will outline some of the developmental processes in first language (L1) reading, the importance of vocabulary knowledge for reading comprehension, and I will review studies that have been done in L1 with regard to morphological awareness and various reading skills. Next I will highlight the differences between learning to read in L1 and beginning to read in a second language (L2). I will show that the need for vocabulary to develop quickly is even more pertinent while the reader is at initial stages of L2 reading. Then, I will review studies that have been done in relationship to L2 English morphological awareness and reading skills in the L2 English. Finally, I will examine studies that have considered the cross-linguistic contribution of L1 morphological awareness to reading skills in the L2, summarize the literature and then draw attention to the gaps that remain in this emerging field of morphological awareness.

2.1. Introduction to First Language (L1) Reading and Vocabulary Development

Learning to read is a complex cognitive and linguistic skill involving several processes, including but not limited to metalinguistic awareness, phonological awareness, syntactic knowledge, vocabulary and comprehension. Unlike developing receptive and productive skills of an oral language through exposure to naturally occurring speech, reading is said to be an unnatural act, which requires focused attention and usually direct instruction. As a result, whereas all typically developing children become fluent in their native language (or language variety), there are many adolescents and adults worldwide with typical cognitive ability, yet no or very little reading ability. Furthermore, readers go through stages of reading development as they become stronger, more advanced readers. For typically developing English speakers, one of the most significant stages is said to occur from a proposed Stage 2 (after about third grade) to...
Stage 3, where they make a shift from ‘learning to read’ – where they are still making phoneme-grapheme connections in words that are mostly familiar to them from oral language, to ‘reading to learn’ – where the basic mechanics of reading have become automatic, and reading itself becomes a tool to acquire new vocabulary and general knowledge (Chall, 1983). Researchers have found that after this developmental shift has occurred, somewhere between the fourth and sixth grade level, different skills become important, i.e. phonological awareness is not as essential for reading comprehension at this stage as are other higher-level text skills and vocabulary knowledge (Goodwin et al., 2012; Katz, 2004; Nagy et al., 2006; Scarborough et al., 1998). The strong relationship between vocabulary knowledge and reading comprehension has been established and shown many times in both L1 (e.g. Anderson & Freebody, 1981; Beck, et al., 1987; Nagy & Anderson, 1984) and L2 (August & Shanahan, 2006; Carlo et al., 2004; Carlo, August & Snow, 2005; Wagner et al., 2007). Researchers are now trying to discern which cognitive and reading processes lead to stronger vocabularies in developing readers, so as to aid comprehension skills.

**Vocabulary Development in L1 Reading**

Like the process of reading, vocabulary knowledge is multifaceted, involving many different stages and strategies. Vocabulary knowledge is often referred to in terms of breadth and depth. Breadth of vocabulary knowledge has to do with the number of words known. Breadth is a key factor in reading comprehension because the greater the number of words that are known, the fewer the words encountered in text that will be unknown, and the more likely it will be that the reader understands the text. Depth of vocabulary is also important in reading comprehension because it has to do with the richness of knowledge that one has about a word. Nagy and Scott (2001) proposed five aspects of complexity to word knowledge: 1- incrementality, 2- polysemy, 3- multidimensionality, 4- interrelatedness and 5- heterogeneity.
The idea of 1- ‘incrementality’ is that one might have varying degrees of knowledge about a word that can increase little by little from having never seen or heard it before to recognizing it in context, to being able to use it in a sentence (Nagy & Scott, 2001). Depth of vocabulary knowledge is represented in both 2- ‘polysemy,’ i.e. knowing multiple meanings of a word, and 3- ‘multidimensionality,’ i.e. knowing specific linguistic features of a word from its phonological and orthographic representation to its syntactic category, morphological analysis, pragmatic use, and frequency. More in depth knowledge about an individual word correlates to a better understanding of it across multiple contexts. Furthermore, Ouellette (2006) adds that the depth and breadth of vocabulary knowledge are stored in the lexical representation of a word, where phonological and semantic associations are kept together. When a child first learns a word s/he may only have some phonological representation available in the lexicon, but as vocabulary growth continues, it is a process of refining phonological representations and adding and elaborating on associated semantic knowledge. The concepts of 4- ‘interrelatedness’ and 5- ‘heterogeneity’ in word knowledge both have to do with the idea that knowledge of a word cannot exist in isolation. Interrelatedness refers to the connection between associated concepts: for example, to assign meaning to the word warm you must have knowledge of the concepts of hot and cold. Heterogeneity is the idea that words have different purposes in language, such as function words like if and but, which may involve a different learning process from open class content words such as nouns, adjectives, and verbs.

The complexity and multidimensionality of knowing a word is important to understand when relating lexical knowledge to reading comprehension. Two points should be made: 1- Knowing a word does not mean knowing a definition and 2- In order to understand a piece of text that contains an unfamiliar word, achieving the highest level of knowledge of that word is most likely unnecessary to comprehend the text. A reader may be able to extract meaning from a sentence in which only one meaning of a word is known, or one in which s/he only recognizes
the word in context. The research reviewed shows that not only breadth of vocabulary, i.e. knowledge of many different lexical items, but also depth of vocabulary is important for reading.

Very little new vocabulary is acquired through direct instruction of teaching individual words (only 10%), despite many noble efforts by teachers in synonym drills, key word memorization, dictionary tasks, and more (Nagy & Anderson, 1984). Learners rely on context clues in text, syntactic structure of the sentence and morphological strategies, such as breaking down words into constituent parts to assign meaning (Anglin, 1993; Katz, 2004). Recent trends in vocabulary teaching acknowledge that all vocabulary cannot be explicitly taught, and that it is important for readers to have rich and varied language experiences to foster increased vocabulary size (Graves et al., 2013). There is also an element of reciprocity between reading comprehension and reading vocabulary knowledge (for example, see Carlo et al., 2004). This means that the correlation between reading vocabulary and reading comprehension is bidirectional:

1. The reader gains a higher level of vocabulary knowledge because s/he is a good reader and most likely reads often.

2. The reader that has both depth and breadth of knowledge of vocabulary knowledge has an easier time comprehending texts on a higher level than someone with a lesser vocabulary.

Out of the thousands of new words school-age children are learning each year, Nagy and Anderson (1984) estimate that about 60% of those are derived words – that is, the meaning could be figured out by breaking down the complex words into their constituent parts and assigning meaning to the whole through analysis of its parts. Nagy and Anderson (1984) expand this point in saying, that “for every word a child learns we estimate that there are an average of one to three additional related words that should also be understandable to the child, the exact number depending on how well the child is able to utilize the context and morphology to induce meanings” (p. 304). Anglin (1993) agrees that the majority of words learned by children after the third grade are derived words that could be figured out through this process of
morphological decomposition. Research on acquiring vocabulary knowledge in text suggests it is best to make use of context clues and morphological structure because context alone is often not sufficient to determine the meaning of an unfamiliar word (Nagy & Anderson, 1984; Schatz & Baldwin, 1986).

Morphological awareness has an interesting connection to reading ability because it is realized at the intersection of phonological awareness, syntactic awareness, orthographic awareness, and semantics, yet it operates as an independent skill (Katz, 2004; Kuo & Anderson, 2006). Because of the interrelatedness of morphological skills with so many other reading related skills, researchers have found that morphological awareness correlates independently with many sub-skills of reading: decoding (word reading), reading vocabulary and reading comprehension (see the following sections of this chapter for review of studies showing these correlations).

To summarize this section, learning to become a competent reader is a complex process that involves a number of interrelated skills, namely phonological awareness, morphological awareness, syntax and vocabulary. There is a strong bidirectional relationship between reading vocabulary and reading comprehension, where many new words are learned incidentally in text with use of context clues and morphological processing; and text comprehension is improved with a greater knowledge of both depth and breadth of vocabulary. Many struggling readers might be unable to make use of syntactic, semantic context clues to learn words incidentally at a rate as high as better readers. Therefore, a promising route to both higher vocabulary development and reading comprehension seems to be through an awareness of morphological structure.

In the remainder of this review of the literature I will begin with a description of inflectional and derivational morphology and how it relates to vocabulary showing contrasts in structure between Spanish and English morphological systems, provide an account of linguistic variables that are posited as contributing factors within awareness of morphologically complex
words, and finally, I will discuss the developmental pattern of morphological ability in reading that has been established in English and other languages. In the following sections I will review theories and research on the relationship of morphological awareness to reading related skills in both the L1 and L2 as well as cross-linguistically.

2.2. Inflectional and Derivational Morphology and Word Formation Processes in Spanish and English

In this section I will give an overview of the difference between inflectional and derivational morphemes and establish the difference between phonological awareness and morphological awareness. I will give examples of Spanish and English morpho-phonological structure and word formation processes to establish that while Spanish and English differ with respect to orthographic representation, they share processes of word formation, which include phonological shifts from base words to morphologically derived words.

Inflectional morphemes are affixes added on to free morphemes to change tense, aspect, person, number, gender and case, resulting in inflected words. In English, they are generally added on as suffixes as in the following examples: plural noun inflectional morpheme –s added to *cake* to make *cakes*; past tense inflectional morpheme –ed added on to *kiss* to make *kissed*. Derivational morphemes are affixes added to stems or base words, usually resulting in a new syntactic category. For example the adjectival base *happy*, with the nominal derivational suffix –*ness* becomes the noun *happiness*. Within derivational morphology, affixes may also be added on to free morphemes (such as in the example *happy*) or bound stems that are the root of a morphologically complex word, but cannot stand alone as free morphemes. An example of a bound stem is the morpheme *quant-* as in *quantity* or *quantify*. Spanish and English are both concatenative languages in that affixes are attached to either bound or free roots as either prefixes or suffixes.

Morphological awareness can be defined as speakers’ “... conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate the structure”
Another related term that is used in the literature is ‘morphological generalization’ or the ability to break down morphologically complex words into the constituent parts for the purposes of assigning meaning to the whole word (Anglin, 1993). Both of these processes can be captured with the term ‘morphological awareness’ and henceforth will be the term used following the majority of literature on this subject (e.g. from Carlisle, 1995 to Ramírez et al., 2013).

It has been well established that phonological awareness is a necessary component for reading success, especially at the decoding level (see Ehri & Robbins, 1992; Goswami, 2000). Phonological awareness is the conscious awareness of the sound structure of a language and the ability to manipulate words by breaking them into segments, such as syllables, and phonemes (Goswami, 2000). Less has been done to understand how morphological processes contribute to the different reading skills. In terms of morphological structure, Spanish and English have different inflectional systems. Inflectional morphology contains a finite number of affixes whose application and use is generally acquired and mastered prior to when children begin schooling (Berko, 1958). On the other hand, the more complex system of derivational morphology is just starting to be understood at the time children enter kindergarten, which is why it appears to be a much more influential factor in reading ability, a skill that also increases immensely at the time children begin school. Spanish has a rich inflectional system with agreement of person, number and gender and English has a weak inflectional system. Although Modern English is known to have a relatively poor inflectional morphology (much of the inflectional system has been lost throughout history since Old English), it does have a rich, or at least highly productive, derivational morphological system, similar to that of Spanish. Spanish and English have different structures in terms of phonological transparency such that Spanish has a transparent, or one-to-one, orthography while English has an opaque orthographic representation. Previous

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3 The term ‘morphological awareness’ may be problematic because there seem to be pre-stages to an ‘awareness’ of morphology, for which the reader may recognize morphological aspects of words without a conscious awareness of this ability to do so.
research has suggested that Spanish-speakers have difficulty while acquiring English literacy because of the opaqueness of English (e.g. Ramírez et al., 2010). English is called an opaque language because often phonemes are represented by one or more graphemes, unlike the one-to-one representation in Spanish. Note the difference between the English word *enough* that has an unpredictable pronunciation of the letters *gh* [f] at the end of the second syllable and the Spanish word of the same meaning, *basta* which is pronounced exactly as it is spelled with every phoneme matching a grapheme. Furthermore, beyond the opaqueness of spelling in English, we find that there are variations in phonology between base morphemes to morphologically complex derived words (i.e. in the morpho-phonological structure); for example in the following morphologically related words the phoneme [d] shifts to [ʒ] *decide* → *decision*. Spanish has some of these morpho-phonological changes as well, although they are not as common (e.g. *decidir* → *decisión* [d] to [s]). Therefore one would posit that children should have both an awareness of phonology as well as morphology in order to become proficient readers especially on the decoding level.

Because derivational morphological complexity is similar in both languages there are a lot of opportunities for awareness and crossover of knowledge between the two languages. The derivational structures are similar in part because many roots and affixes come from Greek and Latin in both languages. The similarities in morpho-phonological structure in the derivational systems can be seen in the following examples in Table 2.1.

**Table 2.1. Examples of Morpho-phonological Structure in Spanish and English**

<table>
<thead>
<tr>
<th></th>
<th>Consonant Shift</th>
<th>Vowel Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base word</td>
<td>Derived word</td>
</tr>
<tr>
<td>Spanish</td>
<td><em>ocho</em> [tʃ]</td>
<td><em>octavo</em> [k]</td>
</tr>
<tr>
<td>English</td>
<td><em>eight</em> [t]</td>
<td><em>eighth</em> [θ]</td>
</tr>
</tbody>
</table>
In Table 2.1 above, in the example in Spanish when the noun ‘ocho’ becomes the derived adjective ‘octavo,’ there is a shift in consonant from [tʃ] to [k]; in English for the same words, ‘eight’ changes to the morphologically derived adjective ‘eighth,’ where a consonant shift occurs from [t] to [θ]. The second example shows a vowel shift in both Spanish and English; the morphological change occurs from the adjective ‘strong’ to the verb ‘strengthen’. In Spanish the root word vowel shifts from a semivowel + vowel diphthong [we] to the monophthong [o]. In English the vowel shift is from [ɔ] to [ɛ]. These examples show that while there is phonological transparency within the orthographic system of Spanish, the morpho-phonological system has a similar level of opacity as does English.

2.3. Linguistic Variables in Morphological Awareness

The phonological shift that occurs in both Spanish and English when certain morphemes are added to base words, as described in the previous section, is an example of one linguistic variable that has been shown to affect morphological awareness, particularly in struggling readers. In this section, I focus on three variables that have been shown to have an impact on morphological ability in previous studies. The three variables are 1- the degree of phonological transparency or opacity between morphologically related words, 2- the frequency of morphologically derived words and 3- cognates in Spanish and English. Each of these variables is important in light of the similarities and differences in word formation processes and morpho-phonological structure between Spanish and English. For example, although Spanish and English differ with respect to transparency of orthographic representation (Spanish is transparent, English is opaque), they have similar morpho-phonological structures; that is in both languages there is a degree of phonological shift when certain derivational affixes are added to base words. Because Spanish and English both come from the Indo-European family of languages, they share both roots and affixes that come from Latin and Greek, so there are many opportunities for cognate recognition.
2.3.1. Phonological Transparency

Researchers disagree on whether difficulties that arise in reading complex morphological structures come from a lack of morphological awareness or if the problem is rooted in a phonological deficit. Some believe that morphological awareness is secondary to phonological ability (e.g. Fowler & Liberman, 1995). The other viewpoint is that morphology makes an independent contribution to reading ability apart from phonology (Mahony et al., 2000). Some derived words are more phonologically and orthographically transparent than others. If the levels of higher phonological shift (less transparency) impede ability to recognize morphological relationships between words, then there may be no separation between phonology and morphology and their contribution to reading ability. However, if it is shown that morphological relationships are recognized regardless of phonological shift, then this will suggest knowledge of morphological structure independent of phonological awareness, and in turn such knowledge may independently influence reading abilities. An example of two words that are morphologically related with a transparent phonological and orthographic representation are *four* and *fourth*, where the base word *four* maintains its sound and spelling structure at the addition of the adjectival morpheme –*th*. An opaque relationship is represented in *decide* and *decision*, where there is a consonant change and spelling change where the letter and sound ‘d’ [d] in the verb ‘decide,’ are replaced with the letter ‘s’ and [ʒ] at the addition of the nominal suffix –*ion*. More examples of opaque representations can be found in the examples in Table 2.1, and a further delineation of phonological shift conditions and examples is below in Table 2.2.

Weak readers in English have been shown to perform poorly compared to stronger readers on morpho-phonological tasks that involve words with higher levels of phonological shift / phonological opacity (Fowler & Liberman, 1995; Leong, 1989; Shankweiler et al., 1995; Windsor, 2000). Although many studies have shown an independent contribution of morphological awareness to reading skills above and beyond phonological skills, there is still a
question as to the extent to which phonological awareness deficits underlie morphological awareness. Following is a list of morpho-phonological conditions that exist in English in Table 2.2., referred to as ‘no shift’ when there is phonological transparency between a root word and its related morphologically derived form and ‘shift’ when a phonological change occurs in the morphologically complex form from the root word.

Table 2.2. Orthographic / Phonological Transparency\textsuperscript{4} in English

<table>
<thead>
<tr>
<th>Shift Condition</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparent</td>
<td>No change in phonology or orthography.</td>
<td>four → fourth</td>
</tr>
<tr>
<td>Orthographic Shift</td>
<td>Change in orthography only.</td>
<td>fame → famous</td>
</tr>
<tr>
<td>Silent Letter Shift</td>
<td>Letter in base word that had no phonological representation becomes represented in the derived form.</td>
<td>sign [sam] → signature [sig] vowel shift: [aɪ] to [ɪ]</td>
</tr>
<tr>
<td>Consonant Shift</td>
<td>Phonological (and/or orthographic) change in consonant. Sometimes accompanied by vowel change.</td>
<td>decide → decision consonant shift: [d] → [ʒ] vowel shift: [aɪ] to [ɪ]</td>
</tr>
<tr>
<td>Vowel Shift</td>
<td>Phonological change in vowel sound.</td>
<td>deep → depth vowel shift: [i] → [ɛ]</td>
</tr>
<tr>
<td>Stress Shift</td>
<td>Stress shifts from one syllable to another, usually accompanied by a phonological vowel change.</td>
<td>‘parent → par’ental</td>
</tr>
</tbody>
</table>

Because of the complexity of the morpho-phonemic structure of English, it will be important to add more research-based evidence as to whether phonological shifts such as the ones presented in Table. 2.2. impede morphological awareness for emergent bilinguals who are developing English language and literacy skills.

\textsuperscript{4} This comprehensive list of shift conditions was adapted from studies such as Fowler & Liberman (1995) and Mahony et al. (2000). However, in many of the studies reviewed, these six shift conditions were collapsed into only four categories: 1-No Shift, 2- Orthographic Shift only, 3- Phonological Shift only (no orthographic shift) and 4- Both Phonological and Orthographic Shift.
2.3.2. Frequency

In addition to the complexity of the morpho-phonological structures of Spanish and English, derivational morphemes also vary with respect to frequency and productivity. Morphemes such as the agentive –er in *teach* → *teacher* are acquired early, by about the age of four years old in native English speakers, while other less productive morphemes such as the adjectival –ous in *continue* → *continuous* are acquired much later in the elementary years (Anglin, 1993). Additionally, according to Katz (2004) less productive morphemes (e.g. -ity, -ify, -ive) usually can be affixed to both free and bound morphemes, for example on the free morpheme *decorate* + *ive* to get *decorative*, or the bound morpheme *fest* + *ive* to get *festive*. Highly productive suffixes (e.g. -ness, -er, ize, -ment) are generally only attached to free morphemes, e.g. *sad* + *ness* becomes *sadness*.

Some studies have shown that the frequency of the morphologically derived word is a significant predictor of morphological awareness of two morphologically related words, above and beyond other factors such as cognate recognition, phonological transparency and semantic transparency (Katz, 2004; Mahony et al., 2000). The purpose of including this variable in studies on morphological awareness is to determine the extent to which frequency of morphologically derived words in English either facilitates morphological awareness or obstructs recognition of morphologically related words. Ramírez et al. (2010) considered morphological frequency in the creation of the morphological awareness tasks used in their study, with half items of low-frequency words and half pseudo-words; however no analysis of the contribution of frequency to related word recognition was performed. The reasoning behind Ramírez et al.’s (2010) decision to include high and low frequency words was to eliminate confounding measures of morphological awareness and vocabulary knowledge.
2.3.3. Cognates

The third linguistic variable is related to both the similarities in Spanish and English morpho-phonological structure and to the frequency variable. Linguists define a **cognate** as a word in one language that is related to a word in another genetically related language, such that the words share an etymological origin from the same prototypical language (Penny, 2009). Nagy et al. (1993) defined cognates as “words with obvious orthographic similarity and closely related meanings” (1993, p. 242). Following previous researchers such as Nagy et al. (1993), Hancin-Bhatt & Nagy (1994), and more recently Ramírez et al. (2013), it is this definition of cognates that I will use in the current study. The purpose of using the adapted definition is that while understanding the etymology, history and interaction of certain language groups under the traditional definition is important, it is not directly relevant to this study. For example, many words that are cognates through a shared etymological history, e.g. Spanish *estrella* and English *star*, have changed in either semantic or phonological representation to the point that they are not easily recognized as “related” words by the non-discriminating language user.

It has become common to see studies in literacy and education borrowing this novel definition of cognate to suit the needs of their research. An example within this definition from Spanish to English could be the word ‘decoration:’ *decoración* and *decoration*. The sound, spelling and meaning from the Spanish representation of the word are retained in the English representation, and therefore a learner of one language might more rapidly learn the word in the second language when the cognate in the first language is already known. An important point about cognate awareness in the two languages of Spanish and English is that sometimes a word might be an everyday one in one language, e.g. *enfermo* in Spanish, yet an infrequent word in English *infirm* (Hancin-Bhatt & Nagy, 1994). This is a sound opportunity to not only expand vocabulary knowledge in the L2 English, but also in a bidirectional way from English to the L1 Spanish by noticing relationships with everyday English words and infrequent Spanish ones.
Ramírez et al. (2013) have shown that cognates played a crucial role in their study on Spanish-English bilinguals in predicting English reading comprehension. In other words, the oral vocabulary measure they used was not significant as a mediating factor on its own between morphological awareness and reading comprehension, but the cognates in the vocabulary task did serve this purpose.

2.4. Developmental Patterns of Morphological Awareness

Based on the research that has considered the three linguistic variables, phonological transparency, frequency and cognates, the findings are that these variables have a greater effect on struggling or low level readers (Fowler & Liberman, 1995; Katz, 2004; Leong, 1989; Mahony, et al., 2000) than on more proficient readers. More specifically, lower proficiency readers had more trouble recognizing relationships between morphologically related words when they were either 1- phonologically opaque or 2- low frequency; furthermore only higher-level readers were able to recognize cognates within the L2 English (Hancin-Bhatt & Nagy, 1994; Nagy, et al., 1993). These findings provide some evidence that the linguistic variables are tied to a developmental pattern in morphological ability. This section will be a review of studies that have noticed these developmental patterns. I will begin with the crossover between morphology and semantics, and morphology and syntax, and then look at the more general developmental patterns in L1 morphological awareness in relation to reading.

2.4.1. Morpho-Semantics and Morpho-Syntax

In 1989, Tyler and Nagy proposed that children might acquire different types of morphological derivational knowledge at different times during their school years (specifically comparing children in grades four, six, and eight). Tyler and Nagy further delineated morphological tasks as tapping into three distinct areas of awareness: relational, syntax,
distributional. Command of each task seems to follow a developmental order with relational coming first and distributional coming last.

1. **Relational**: The recognition that two words are semantically related. For example, the researchers would ask if the following word pairs are related: ear → eerie, silver → silverize.

2. **Syntactic**: Syntactic knowledge has to do with knowing that certain derivational suffixes mark a specific syntactic category, i.e. that –ize signifies verb. This knowledge can be tested using nonsense words in sentence context and asking participants to choose which derivational affix makes the word fit the sentence. An example sentence: *I wish Dr. Who would just __________ and get it over with*; answer choices a) transumpation, b) transumpative, c) transumpate, d) transumpatic. The correct answer (c) indicates that the learner associates the suffix –ate with a verb required in the sentence blank -- here the nonsense verb transumpate.

3. **Distributional**: Knowledge of this type is knowing that the agentive suffix –er attaches to certain verbs such as play → player to form a noun, but that it does not attach to others nouns to form an agent as in *piano → pianer*, but piano → pianist is the way to form an agentive from this particular noun. Because distributional knowledge depends upon a child’s prior development of syntactic knowledge, Tyler and Nagy (1989) found it to be the last type of derivational knowledge acquired by children, as noted above.

These three different aspects of morphological awareness are fundamental because each type of knowledge may be more closely related to the various abilities necessary to be successful within reading tasks. For example, if relational knowledge is acquired first, this should be apparent in those who are less proficient readers. For example, Tyler and Nagy found that relational knowledge was developed before fourth grade while sixth graders were still exhibiting errors in their developing system of syntactic derivational knowledge which continued to increase through eighth grade (1989). The syntactic properties of morphological relationships may not be recognized until readers become more proficient. When a reader becomes aware of the syntactic knowledge related to derivational morphemes, and has the ability to make use of both context and morphology, it is known as morpho-syntactic awareness. This awareness also
appears to be the strongest predictor within morphological awareness tasks to reading comprehension skills (Katz, 2004).

### 2.4.2. The Developmental Pattern of Morphological Awareness Across Languages

Evidence from diverse languages such as English and Arabic suggests a developmental pattern for morphological awareness noting differences in ability as early as kindergarten through third grade (Kirby et al., 2012), with a sharp increase occurring somewhere in the upper elementary grades, most likely between fourth and sixth grades (e.g. Abu-Rabia, 2007; Carlisle, 2000; Mahony et al., 2000; Nagy et al., 2003; Nagy et al., 2006; Wysocki & Jenkins, 1987). The relationship between morphological awareness and reading comprehension also strengthens around this time as morphological awareness becomes more important to reading success and phonological awareness becomes less important. Research has shown that there are two possible pathways from morphological awareness to reading comprehension, one through vocabulary development, the other a more direct route, bypassing vocabulary. The second path is considered possible because of the unique characteristics of morphological awareness and the complexity of linguistic knowledge that it involves. In the following sections, I review studies that have demonstrated these patterns of morphological development by comparing participants at different proficiencies on the same tasks.

### 2.5. The Role of Morphological Awareness in First Language (L1) Reading Skills

In this section I will review research that has been conducted in L1 on the relationship from morphological awareness to reading skills. I have divided the section into four subsections on morphological awareness in L1: 1- relationship to phonological awareness, 2- relationship to vocabulary, 3- relationship to reading comprehension, and 4- evidence in L1 from languages other than English. In order to carry out the research in this field, a number of different tasks
have been used to measure morphological awareness skills. A summary of the tasks used, with examples, is in Table 2.3 below.

Table 2.3. Summary of Morphological Awareness Tasks in the Literature

<table>
<thead>
<tr>
<th>Task Type</th>
<th>Measurement</th>
<th>Example</th>
<th>Description</th>
<th>Source</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphological Awareness: Relational (Semantic)</td>
<td>Comes-From Task (CFT)</td>
<td>Does the word skinny come from the word skin?</td>
<td>Derwing (1976)</td>
<td>Group, oral + written, five-point scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test of Morphological Relatedness (MRT)</td>
<td>Non-related: Are ear and earth related? Related: Are eight and eighth related?</td>
<td>Mahony et al. (2000)</td>
<td>Group, oral + written, yes/no</td>
<td></td>
</tr>
<tr>
<td>Morphological Awareness: Syntactic</td>
<td>Test of Morphological Structure (TMS)</td>
<td>Production: Warm. He chose the jacket for its [warmth]. Decomposition: Growth. She wanted the plant to [grow].</td>
<td>Leong (1989)</td>
<td>Individual, oral + written, fill-in the blank</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suffix Choice Test</td>
<td>I wish Dr. Who would just ______ and get it over with a) transumptionation b) transumptionative c) transumptionate d) transumptionatic</td>
<td>Mahony (1994); Nagy et al. (2003)</td>
<td>Group, oral + written, multiple-choice</td>
<td></td>
</tr>
<tr>
<td>Morphological Awareness: Compound</td>
<td>Compound Structure Test</td>
<td>Which is a better name for a bee that lives in the grass? A grass bee or a bee grass?</td>
<td>Nagy et al. (2003)</td>
<td>Group, oral + written, multiple-choice</td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>Test of Absolute Vocabulary Knowledge (TAVK)</td>
<td>Definition Task</td>
<td>Anglin (1993)</td>
<td>Group or Individual, open-ended</td>
<td></td>
</tr>
</tbody>
</table>

2.5.1. Research on Morphological Awareness and Phonological Awareness

In this section I will review studies that looked at the relationship between morphological awareness and phonological awareness. The research review will show that there are disagreements in the research about the degree to which phonological shift conditions impede reading skills such as morphological awareness.

Derwing (1976) used a task that asked whether one word comes from another. His participants included children, adolescents and adults who were asked to judge whether pairs of words were semantically related and were instructed to give a response on the following five-
point scale: 4) no doubt about it 3) probably 2) can't decide 1) probably not 0) no way. The items were related on different levels of phonological transparency, kitty → cat (which has a high level of semantic transparency, but lower level of phonological transparency as seen with the shift in vowel), and semantic transparency skin → skinny (these are closely related phonologically, yet have undergone some semantic drift in related meaning). This measure was purely to determine the participants’ relational knowledge of morpheme families, not within a reading context. Derwing (1976) concluded that morpheme recognition increases as semantic and phonetic similarity increase and that morpheme recognition is more highly related to semantic similarity than to phonetic similarity. That is, learners are more likely to recognize words that are closely related in meaning as being related to each other (e.g. kitty and cat) than they are words that are closely related in sound structure, but distantly related in meaning (e.g. skin and skinny).

In an attempt to distinguish differences between phonological and morphological deficits, Leong (1989) measured morphological awareness in fourth, fifth and sixth graders who were performing below average in reading comprehension. In two experiments, the test used contained two components; one that required children to produce derived forms given the base, the other required them to decompose morphologically complex words into their base forms. In both tests the children were asked to vocalize the target word. The test began with either a derived word (Experiment 1) or a base word (Experiment 2) on a computer screen followed by a sentence with a blank at the end prompting the child to produce the target form. A derivation example: Warm. He chose the jacket for its ____________ [warmth]. An example of the decomposition task: Growth. She wanted the plant to ____________ [grow]. The target words were divided into varying degrees of transparency and phonological/orthographic shift conditions.

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5 Reading comprehension was measured with a component of the Canadian Test of Basic Skills (CTBS).
In order to measure their success in this task, Leong (1989) looked at reaction times for the different age groups. Furthermore, participants were analyzed as three sub-groups of better readers and spellers (R+S+), worse readers and spellers (R-S-) and a mixed group, determined by standardized measures. The results showed that the older below-average readers performed better than the younger below-average readers and that the better readers and spellers (R+S+) reacted much faster in producing target forms than the worse readers and spellers (R-S-) and the mixed group performed somewhere in the middle of the two. Within the fourth grade group there was no significant difference between better readers and spellers on any of the transparent or shift conditions. However, for the fifth and sixth graders there was a significant difference between the sub-groups, but only for the morphologically related pairs that included an orthographic change (such as happy → happiness) or both an orthographic and phonological change (explain → explanation). This suggests that there may be a developmental change in the processing of orthographic information between fourth and fifth grades. An important finding of this study was that the children’s processing times increased from the transparent (no change) condition through the orthographic change, phonological change and both ortho-phonological change conditions, suggesting that the less transparent derived words were more cognitively and linguistically demanding to process.

Fowler and Liberman (1995) posited that reading disability stems from fundamental phonological deficits. They worked with children aged 7.5 – 9.5 years old, in grades two – four, who were divided into three groups of “low,” “mid” and “high” performing readers. They assessed the morphological awareness of the children using a similar test to that of Leong (1989) with both the decomposition and derivation components, where the primer words and sentences were read aloud to the children and the children were required to orally produce the target forms. The test was modified to include only words that children of this age group would be expected to have familiarity with. There were both transparent and shift conditions in the morphologically complex words. The students were also divided into two groups: more skilled
readers and poor readers – based on word recognition, word attack and teacher evaluation. When matched for age and receptive vocabulary knowledge⁶, the researchers found that the more skilled readers outperformed the poor readers on the total score for morphological production tasks. However, there were no significant differences between the more skilled readers and the poor readers on the phonological transparent condition, only on the phonological shift condition.

The strongest correlation to decoding ability⁷ was the condition where children had to decompose morphologically complex phonological shift forms into their base forms, as in *Fourth. When he counted the puppies there were __________ [four].* Because the transparent condition had minimal contribution to decoding skills in comparison to the shift condition, and due to the fact that the poor readers had no problems with the transparent condition as compared to the more skilled readers, the researchers concluded that the problem in recognizing relations between the morphologically complex shift words was that the phonological alternations masked the poor readers’ ability to see relatedness. Fowler and Liberman (1995) concluded that, “…phonologically demanding tasks tax the poor reader unduly, much more so than can be explained by either vocabulary knowledge or general metalinguistic factors” (p. 178). In a similar study, Shankweiler et al. (1995) confirmed Fowler & Liberman’s findings and concluded that phonological deficit underlies reading disability.

Mahony et al. (2000) also compared morphological sensitivity to decoding ability to see if such sensitivity had an independent contribution above and beyond phonological awareness. Morphological sensitivity was defined by a task where children in grades 3-6 were asked to respond YES or NO to whether pairs of words were morphologically related to each other. This task was administered in both a written form where students read word pairs silently and circled

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⁶ Measured by the Peabody Picture Vocabulary Test PPVT, an oral vocabulary test where the researcher reads increasingly difficult words aloud and participants are asked to point to the picture that represents the word.
⁷ Decoding ability was measured by Word Attack and Letter-Word Identification sub-tests from Woodcock-Johnson.
YES or NO if they found them to be related, and in an oral + written format where the researchers read the word pairs aloud to the students who then circled YES or NO. Decoding ability\(^8\) and vocabulary\(^9\) were measured to look for correlations between morphological awareness and these tasks. The researchers found that the scores on each of the tests correlated with grade level and that there were significant differences between the average scores by students in each of the grades, suggesting an increase in ability with age in both the oral and written tests. This further suggests that morphological skill increases with age and not only reading ability. More importantly, they found that there was a significant correlation between the morphological tasks and both of the decoding sub-tests, as well as the vocabulary measure.

In a second experiment, Mahony et al. (2000) matched children in grades three to six in vocabulary knowledge\(^10\), repeated the relational morphological awareness assessment and administered a test of phonological awareness. In this study they found significant differences between grades four and five on the phonological measures as well as on the oral version of the morphological awareness task but not between grades three to four or five to six. These findings suggest that children’s sensitivity to morphology independently correlates with decoding ability beyond phonological and vocabulary effects. Of equal importance in their findings is that in five different Transparent and Shift conditions tested within the morphological awareness measure, they found that there was no relation between pattern of difficulty and phonological complexity. The pattern of performance seemed to be more related to frequency of the suffix, base and derived forms. Overall, they found that the morphological relatedness task, even in the oral format, contributed about 5% unique variance to decoding, a small yet significant contribution.

From the literature reviewed in this section, it looks as if morphological awareness does play a significant, independent role in decoding ability above and beyond phonological

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\(^8\) Decoding ability was measured using the Woodcock-Johnson Word Identification and Word Attack sub-tests.

\(^9\) The WISC-R is a test of vocabulary that can be given in oral or written form. The participants are given a word and asked to supply a meaning for it.

\(^10\) Measured by the Peabody Picture Vocabulary Test-Revised PPVT-R.
awareness (Mahony et al., 2000); however poor readers may experience difficulty in recognizing morphologically related word pairs when phonological shifts occur (Fowler & Liberman, 1995; Leong, 1989; Shankweiler et al., 1995). There is also a confirmation of the developmental pattern seen in this literature, as the higher readers outperformed the lower readers, particularly those between fourth and fifth grade (Mahony et al., 2000). Derwing (1976) suggested that semantic similarity plays a more important role in recognizing morphologically related words than phonological transparency.

2.5.2. Research on Morphological Awareness and Reading Vocabulary

The next studies will focus on the role of morphological awareness and depth and breadth of reading vocabulary. Wysocki & Jenkins (1987) looked at students in the middle grades (fourth, sixth and eighth grades) and their ability to use context clues and morphological generalization to determine the meanings of new words encountered. The purpose of their study was to find out the role of context and morphological awareness in assigning meaning to new words in text. All students were matched for vocabulary level (high performing fourth graders, average sixth and eighth graders). The test was comprised of 12 word pairs that were morphologically related. Six of the base words were taught to the children prior to testing to see if they would be able to derive the meaning of the morphologically related pair from context and/or from morphological generalization (based on familiarity with the taught word). For example, the researchers would teach the word repudiate and measure whether the participants could figure out the meaning of repudiation in context based on knowing the taught definition of ‘repudiate.’ Students were given sentences with morphologically related forms of the stimulus words (e.g. melancholic) in either a strong context (e.g. ‘after Jack’s puppy died his melancholia was so bad that he didn’t want to play with his friends’) or weak context (e.g. ‘her melancholia lasted seven days’) and then were asked to define the words. The strong context provides both
semantic and syntactic cues for interpreting the target vocabulary item, while the weak context only provides support with syntactic cues.

The researchers found that older students (sixth and eighth graders) were better at using context clues to determine meaning than fourth graders. In the weak context, they were able to measure morphological generalization and found no significant differences between sixth and eighth graders in their ability to use morphological generalization; however both of the older groups well surpassed the level of the fourth graders on this task. The relevance of this finding is that it provides more evidence for the developmental shift between fourth and sixth grade in morphological awareness, i.e. the sixth and eighth graders could derive meaning through morphologically related words and the fourth graders could not. The researchers were also able to see the relationship between morphological awareness and vocabulary because the older students were able to use their morphological awareness skills to generate meaning of novel morphologically derived words in context.

Carlisle (2000) looked at the relationship between children’s knowledge of the meanings of morphologically complex words and awareness of word structure in both third graders and fifth graders. She used a syntactic fill-in the blank morphological awareness test and correlated those results to a vocabulary definition task, developed by Anglin (1993). A second vocabulary test was given where the children were required to read a word and choose a definition from multiple-choice options. Her findings showed significant correlations between the morphological awareness task and the definition task for both third graders and fifth graders; and they accounted for 26% (for third grade) and 43% (for fifth grade) of the variance in the vocabulary definition task. Only the derivation component (production of a morphologically derived word), not decomposition, of the morphological awareness task contributed significantly to the regression with the definition task. For third grade, there was no significant contribution of morphological awareness to the multiple-choice vocabulary sub-test. However,  

11 Comprehensive Testing Program (CTP)
for fifth grade morphological awareness accounted for 6.8% of the variance on the vocabulary sub-test. In addition to this finding, Carlisle found that participants were much more accurate at decomposing morphologically derived words than producing them in the morphological awareness task; and the accuracy on phonological shift words compared to transparent words was also significantly different, favoring the transparent words. This research provides more evidence that there are stages in development in morphological awareness; i.e. there was a stronger contribution of morphological awareness to vocabulary for the fifth graders than for the third graders.

In summary, these studies on the relationship of morphological awareness and reading vocabulary in L1 together suggest that sixth and eighth graders are able to use morphological awareness to help assign word meaning even when semantic context is weak; though the semantic context of the sentences may have been weak, there were still syntactic clues in the sentences that could help the older students assign meaning (Wysocki & Jenkins, 1987). In Carlisle’s study, a developmental trend was also observed between third and fifth graders. Her findings also suggest that morphological awareness tasks such as the one she used that require students to understand morphologically complex words in context were correlated to both a multiple-choice vocabulary test as well as the more abstract definition task for the fifth graders. Nagy et al. (2006) also found a correlation between morphological awareness and reading vocabulary, which will be discussed in more detail in the next section.

### 2.5.3. Research on Morphological Awareness and Reading Comprehension

The last two sections have established that there is a correlation between morphological awareness and phonological awareness, and between morphological awareness and vocabulary. The research in those sections has also given evidence for the fact that the relationship to the higher level reading skills (up from phonological skills to vocabulary) is stronger with more
proficient readers at higher grade levels. In this section, I will review studies on the relationship of morphological awareness to the highest cognitive process in reading: reading comprehension.

In the same study of third and fifth graders on the relationship between morphological awareness and knowledge of word structure, Carlisle (2000) explored the relationship between morphological awareness and reading comprehension. For the fifth graders there was a unique, yet small, contribution of morphological awareness to reading comprehension, which accounted for about 13.7% of the variance. For the third graders, there was a combined contribution to reading comprehension of 41% from three measures: a word reading task (decoding morphologically complex words), the morphological awareness task and the vocabulary definition task; however, the unique contribution of each independent sub-test was minimal. This shows that morphological awareness had a more direct effect on reading comprehension for the fifth graders than it did for the third graders.

Nagy, et al. (2003) examined the relationship of morphology to literacy skills in at-risk second grade readers and at-risk fourth grade writers. Morphological Tasks included a test that required the children to fill in the blanks with real and nonsense words with the correct morphological suffix that was appropriate for the context of the sentence. This task tapped into the morpho-syntactic abilities of the participants because it required understanding of which derivational suffix assigned the necessary syntactic category. A compound test that measured the ability to recognize concatenation of two free morphemes asked the children to solve compound word riddles such as “Which is a better name for a bee that lives in the grass? A grass bee or a bee grass?” and the researchers administered a morphologically relatedness task (adapted from Mahony et al., 2000). The scores indicated that the three morphological tasks were difficult for the at-risk second grade readers. The scores on the morphological tasks moderately correlated with each other and were all more strongly correlated with oral

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12 Reading comprehension task was taken from the CTP.
13 Children were determined to be at-risk based on their performance on grade-specific standardized reading and writing measures.
vocabulary knowledge\textsuperscript{14} and reading comprehension\textsuperscript{15}, even more so than the correlations of morphology to word reading and spelling. The morphological tasks had the strongest contribution to reading comprehension over other language predictors; phonological and orthographic tests were also administered. Nagy et al. (2003) further concluded that because of the strong correlation between oral vocabulary and morphological tasks, morphological awareness may indirectly contribute to word reading. The fourth grade at-risk writers performed better on the morphological tasks than the second graders but were still far from ceiling. The three morphological tasks again for the fourth graders were correlated with oral vocabulary and reading comprehension; and the morphological tasks were the strongest contributor to reading comprehension.

Katz (2004) examined the role of morphological awareness in reading comprehension tasks among fourth and sixth graders. She gave a number of differentiated morphological awareness tasks to 147 participants in her study. Her main objectives were to: 1- find out whether accurate reading of morphologically complex words in texts significantly contributes to reading comprehension and 2- to identify what specifically within morphological awareness contributes to reading achievement (in particular reading morphologically complex words and reading comprehension). Her first objective was confirmed: accuracy of reading morphologically complex words significantly contributes to reading comprehension\textsuperscript{16}. She also found that morphological problem solving (as defined by the vocabulary definition task – Anglin, 1993) and morphological awareness (measured by morphological awareness in syntactic context\textsuperscript{17}) both significantly contributed to reading comprehension when controlling for vocabulary knowledge, decoding, word recognition and other morphological tasks. Both of these tasks required relational knowledge and syntactic knowledge suggesting that the combination of both of these

\textsuperscript{14} WISC-III Oral Vocabulary
\textsuperscript{15} Gates-MacGinitie
\textsuperscript{16} Katz (2004) used the Qualitative Reading Inventory – 3 (QRI-3) for reading comprehension and the Reading Complex Words (RCW) task that asked students to read words aloud. She recorded their accuracy, fluency and processing time in decoding.
\textsuperscript{17} Test of Morphological Structure (TMS)
areas of knowledge is what most significantly affects reading comprehension (Katz, 2004). She suggests that both of these tasks may turn out to be more significant than other tasks that only rely on relational knowledge (e.g. whether one word “comes from” the other).

A later study done by Nagy, et al. (2006) looked at the contribution of morphology to literacy in older students (upper elementary and middle-school age from grades four to nine). They found that performance on morphological tasks increased consistently over the range of grade levels examined and that morphological awareness made a significant unique contribution at all grade levels to reading comprehension, reading vocabulary and spelling. Both reading comprehension and reading vocabulary were measured using sub-tests of the Stanford Diagnostic Reading Test. The strongest contribution was made to decoding accuracy tasks, especially at the fourth/fifth and sixth/seventh grade levels and was especially significant for shift condition derived words. At the eighth/ninth grade level morphological awareness was only correlated to decoding rate, suggesting that morphological awareness first makes a stronger contribution to decoding accuracy and then to reading fluency at a later age (Nagy et al., 2006).

There is also evidence in the literature that morphological awareness (both inflectional and derivational) predicts reading comprehension for low-literacy adults aged 18-57 (Tighe & Binder, 2013). Past studies have shown that adults with low literacy skills tend to have deficits in decoding and phonological awareness when matched with children at similar reading levels, although adults have superior sight word and orthographic recognition (Greenberg, Ehri & Perrin, 1997). Tighe and Binder (2013) were the first to establish that consistent with literature on children, morphological awareness does make an independent contribution to reading comprehension for adults, beyond that of phonological awareness. They used two measures of morphological awareness: one that measured both decomposition and derivation (Carlisle, 2000), and a pseudo-word suffix choice test (Mahony, 1994). In each of the production and decomposition tasks the items were created to contain equal numbers of transparent and opaque shift conditions as well as both high and low frequency words. They found that the
measures of morphological awareness with a composite score contributed 37.3% of the variance in the regression with reading comprehension beyond phonological awareness.

To summarize this section, we see that different morphological awareness tasks have correlated with reading comprehension, and again that the ability increases with age. Katz (2004) also makes an interesting note: the morphological awareness tasks that tap into both syntactic and relational knowledge may be stronger predictors of reading comprehension than those that are simply relational. The fact that the morpho-syntactic environments are better predictors for reading comprehension also follows from the research that shows that there is a developmental trend in morphological awareness where relational knowledge comes earlier than morpho-syntactic knowledge (Tyler & Nagy, 1989).

2.5.4. Morphological Awareness in Reading in Languages Other than English

Compared to the larger number of studies conducted in English, there is still little work that has been done on morphological awareness and its role in reading in languages other than English. Nonetheless, similar findings to that of English have been discovered in at least two dissimilar languages, Chinese and Arabic. In this section I will outline two studies: one in Chinese (Ku & Anderson, 2003) and one in Arabic (Abu-Rabia, 2007). The reason for this choice is that both Chinese and Arabic differ significantly with respect to their morphological typology and it is key to show that morphological awareness plays an important role in reading ability even in languages with a different structure from that of English.

Languages are distributed among three classifications with respect to morphology (Wade-Woolley & Geva, 1998). Isolating Languages are languages that have words that are typically monomorphemic and cannot be reduced to any smaller meaningful units. Chinese is an example of an isolating language; however, it does allow two units to be joined together to form

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18 Reading comprehension was measured with the Passage Comprehension sub-test from the Woodcock Reading Mastery Tests – Revised (1987).
a compound word in a similar construction as in Nagy et al. (2003), which asked what a better compound word would be, *bee grass* or *grass bee*? Concatenative Languages are languages that string together derivational morphemes in a linear fashion. English and Spanish are examples of concatenative languages. *Nonconcatenative Languages* such as the Semitic languages (i.e. Hebrew and Arabic) are languages in which the root is modified to form semantically related words.

Chinese has a one to one mapping of morpheme to syllable and each morpho-syllabic unit is represented by one Chinese character. Because Chinese is semantically transparent, children are able to use the knowledge of morphemes they have previously learned to apply to new words that they encounter (McBride-Chang et al., 2007). Ku and Anderson (2003) examined both English-speaking children in the United States and Chinese-speaking children in Taiwan in grades two, four and six to determine the role of morphological awareness in reading tasks in each of the languages. They administered a series of morphological tasks that tapped into both syntactic and relational morphological knowledge and correlated these tasks to a multiple-choice reading comprehension test (different tests were administered to the children in the different language groups). The researchers’ findings suggest that in both Chinese and English children’s ability in morphological tasks increases with age. This finding is in line with the other studies that have been reviewed involving English only. Strong correlations between morphological awareness and reading comprehension were also found in both the Chinese-speaking children (*r*-values ranging from .63 to .73) and for English-speaking children (*r*-values ranging from .60 to .67). They also found strong correlations with vocabulary knowledge, but these relationships were not as strong as morphological awareness to reading comprehension. The measure that Ku and Anderson used for vocabulary knowledge was just a selective task where students checked off whether or not they knew a word. Perhaps their data on morphological awareness and vocabulary knowledge would have been more robust if they had used a test that instead captured the full range of reading vocabulary skills. Nonetheless, the
researchers conclude that since similar findings were obtained in two languages as different as Chinese and English, this suggests that morphological awareness is universally important in learning to read (Ku & Anderson, 2003).

Arabic derivational morphology differs from that of English in that it is root-based. Arabic roots are either trilateral, as in /k-t-b/ “has to do with writing” or quadrilateral as in /d-h-r-j/ “to roll” (Abu-Rabia, 2007). In order to form semantically related words in Arabic from the roots, vowel patterns are inserted into the root. For example the root /k-t-b/ can become /kateb/ “writer”, /kataba/ “wrote” and /inkataba/ “has been written” varying the placement of vowels into the root pattern. Abu-Rabia (2007) found that Arabic morphological awareness patterned similarly to results for native English speakers in that both morphological derivations and decomposition tests of morphological structure were significant predictors of Arabic reading comprehension among children in grades three, six, nine and twelve. This study also compared normal and dyslexic readers in each of the grades and found that the normal readers outperformed the dyslexic readers on all measures, but that morphology and spelling were the best predictors of reading accuracy and comprehension in all grades and for both types of readers (Abu-Rabia, 2007).

From all of the studies in L1 reviewed, across varying typologies, it is clearly shown that there are developmental stages for morphological awareness, with an increase somewhere between fourth and sixth grade. The second trend is that morphological awareness contributes independently to several reading skills, including phonological skills, vocabulary and reading comprehension. Furthermore, the phonological opacity in shift conditions between morphologically related words seems to be a barrier to morphological awareness for lower-proficiency and/or struggling readers.
2.6. Overview of Second Language (L2) Reading and Vocabulary Development

When children learn to read in their first language, the process is a matter of linking graphemes to words they have in their oral vocabularies. Children learning to read in the L1 will have had years of experience with oral vocabulary, and up until about third grade, texts are designed to teach children how to decode – performing a phonological / orthographic connection (Chall, 1983). Conversely, most second language readers will begin reading in the L2 at the same time that they are acquiring oral vocabulary in that language. Therefore, their job is much more difficult because aside from assigning grapheme to phoneme knowledge, they also have to assign semantic information to the new words encountered. There is a vast difference between acquisition of vocabulary in a first language and acquisition of vocabulary in a second language. Previous research has demonstrated the importance of vocabulary knowledge as a precursor to reading comprehension in both L1 and L2. As aforementioned, vocabulary knowledge is measured in terms of both breadth, i.e. the number of words known, and depth, i.e. how well each word is known. For second language learners there are more challenges to gaining breadth and depth in vocabulary, especially in reading vocabulary (Carlo et al., 2004). There remains an enormous gap in vocabulary skills between emergent bilinguals and native English speakers at the same grade level, which only underscores the importance for vocabulary learning strategies for emergent bilinguals.

Research suggests that the development of literacy in the student’s L1 can become a skill that will transfer into the L2 (e.g. Cummins, 1979, 1991). Well-equipped immigrants, from advantaged socioeconomic backgrounds need at least four years before the academic skills they have already developed in their first languages will transfer to the second language; one can imagine that less-advantaged immigrants will take even longer to achieve this kind of success. Cummins (1979) termed this concept the interdependence of first and second language proficiency. The research is less clear about what facilitates the transfer of this skill, and which
specific sub-skills are most necessary for successful transfer. Furthermore, when first language literacy skills are low, evidence suggests that there is little positive transfer (Cummins, 1991). In this case, it is difficult to distinguish whether problems that arise in second language reading actually stem from academic deficits in the first language or from low levels of second language ability.

According to Alderson (1984) reading in a second language is not always a reading problem; it may be a language problem. The language problem might result from low-level skills in the first language, which therefore cannot be transferred. On the other hand, the language problem may be due to the fact that the learner has not reached a threshold in the second language where the learner has had insubstantial acquisition of second language vocabulary that inhibits text comprehension and can possibly even impede first language transfer from occurring. In the case of many secondary school emergent bilinguals in the U.S., they are experiencing a language problem and a reading problem, i.e. many come with low-level academic language in the L1 and little knowledge of the L2 linguistic system, as well as low-proficiency reading skills in the L1 to transfer to English reading. Therefore, they not only need to acquire English in order to read in English, they need to develop foundational language and literacy skills in their L1 so that they can transfer them to English.

Learning to read in a second language is not as straightforward a process as learning to read in a first language. Koda (2004) points out that within second language reading there is a great deal of variation in length of exposure to the second language (in both oral and literate contexts). Furthermore, second language readers come from varied age groups; there is no standard age that a student begins to read in a second language. The second language group is not homogeneous like the first language group and therefore may result in more variation in individual results. According to Koda (2004), L2 learners have to link four lexical elements in learning a new word (one more than L1 learners do). They have to learn: symbol, sound, meaning, and in addition to that, the first language equivalent.
Vocabulary Development in L2 Reading

The last section of the literature review, which discussed the process of reading in the L1, brought forth the importance of vocabulary to reading comprehension, noting how morphological awareness strongly correlates to both vocabulary and reading comprehension. We know that native English speakers need to develop vocabulary to be successful readers, especially once they pass the ‘learning to read’ stage at around grade three (Chall, 1983) when they are encountering many novel words in text. From the literature, we also know that beginning to read in a second language is different from the first, because L2 readers do not have the support of the L2 oral language (e.g. knowledge of the phonological rules, syntax, morphology and vocabulary) to help decode and comprehend what is read.

The importance for emergent bilinguals to develop vocabulary is even greater. For example, Carlo et al. (2004) used an intervention program to teach explicit word meanings to fourth and fifth grade emergent bilinguals and English speakers. They incorporated techniques in understanding polysemy, morphological awareness, cognate recognition and cross-linguistic aspects of word meaning. They found that their intervention did indeed improve the performance on receptive vocabulary tests for both groups to equal degrees. They also found that after just one year of intervention, improved word knowledge also resulted in improved reading comprehension scores. The effect of gain in reading comprehension was slight, yet notable. Instead of just teaching word meanings, the researchers gave the students strategies on deciphering word meanings in novel words, through using word study strategies such as morpheme and cognate recognition.

Carlo et al. (2005) also addressed the need for vocabulary development in emergent bilinguals. In a comparison of emergent bilinguals to English speakers in fourth grade, Carlo et al. (2005) found that emergent bilinguals lagged behind their native English speaking peers significantly in breadth of vocabulary (measured by the PPVT-R) and this gap did not diminish over the course of one year. Moreover, emergent bilinguals only performed about half as well as
native English speakers on a test designed to measure depth of vocabulary knowledge. The gap might have been even larger if the native English speakers’ scores hadn’t approached ceiling level.

In order to compete with the rigors of school in the U.S., emergent bilinguals will need to quickly develop vocabulary in order to succeed. Huckin and Coady (1999) suggest that most vocabulary acquisition that takes place for emergent bilinguals is incidental through reading. The concern is that in order to ‘guess’ a meaning of a novel word in a reading context, the learner must be able to identify somewhere between 95 – 98% of the other words in the text in order to use the context to inform the ‘guess.’ Huckin and Coady (1999) conclude that emergent bilinguals must be familiar with an average of 3,000 word families in order to recognize 95% of the words on the page of a basic text; otherwise too many words will be unknown and there will be no room for using semantic, syntactic or morphological cues to assign new meanings.

2.7. The Role of Morphological Awareness in L2 Reading Skills

A growing number of studies have emerged over the past several years, which are of interest to the role of morphological awareness in reading for emergent bilinguals. This section of the literature review is divided into two sub-sections: one that is a review of studies on morphological awareness and reading skills in L2 English only, and the second is a review of studies on cross-linguistic relationships of those variables.

2.7.1. Research on Morphological Awareness and Reading Skills in L2

Koda (2000) looked at differences in morphological processing between adults learning English as a second language (ESL), from Korean and Chinese first language backgrounds. The second study looked at the role of derivational morphology in reading comprehension among Spanish-speaking emergent bilinguals (Kieffer & Lesaux, 2008). A further study by Goodwin et al. (2012) on Spanish-speaking emergent bilinguals contributed longitudinal data from fourth to
fifth grade on the relationship of morphological awareness and phonological decoding to reading comprehension.

Koda (2000) compared reaction times on morphological processing tasks between ESL adults from Korean and Chinese backgrounds. The Korean-speaking participants were used as a control group, because Korean uses the same method of concatenation in derivational morphology as does English. As mentioned earlier, Chinese is an isolating language, which uses a compounding structure for derivational morphology. The researcher’s prediction was that the Korean speakers would perform better on three morphological tasks (1- intraword analysis efficiency, 2- intraword structural sensitivity and 3- morphological and contextual information integration ability) than the Chinese speakers due to the fact that the Koreans’ first language has a more similar morphological structure to English. However, her findings showed that the two groups performed similarly in task 1, the Korean speakers performing better in task 2 and the Chinese speakers performing faster and more accurately in task 3. Koda (2000) concludes that the range of findings suggests that L1 processing experiences can predict some but not all aspects of morphological awareness in the L2.

Kieffer and Lesaux (2008) longitudinally examined Spanish-speaking emergent bilinguals from fourth to fifth grade. They wanted to establish whether or not derivational morphological awareness predicts reading comprehension when controlling for vocabulary, phonological awareness and word reading abilities and find any change in performance from fourth to fifth grade. They used the decomposition sub-test to measure morphological awareness, and correlated this to two measures of reading comprehension. They also controlled for word reading, phonological awareness and receptive vocabulary using other standardized assessments. The results revealed similar findings to that of the native English studies. There was a strong correlation between the morphological awareness

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19 They used both a Passage Comprehension sub-test of the Woodcock Language Proficiency Battery (a cloze test) and the multiple-choice Gates-MacGinitie.
assessment and both reading comprehension tasks in fifth grade, though not in fourth grade. Between fourth and fifth grade, there was an increase in the strength of the relationship between morphological awareness and reading comprehension and there was a significant increase in performance level on morphological tasks from fourth to fifth grade. These results support the native language evidence that morphological awareness is shown to be a significant contributor to reading comprehension, and that there is a developmental trend that morphological awareness increases with age and ability. A question remains whether the increase is tied to one or the other, i.e. is it something that increases with age and more general knowledge or is it something that increases with reading ability?

Goodwin et al. (2012) also looked at whether morphological awareness made a unique contribution to English reading comprehension for a group of Spanish-speaking emergent bilinguals. To analyze the relationship between these variables they set up a model of regression analyses. They found that the relationship between fourth grade morphological awareness did have an indirect effect on reading comprehension in fifth grade, through reading vocabulary\(^{20}\) (a measure that required students to read a word then to give a synonym or antonym) as the mediating variable. There was no direct effect of morphological awareness on reading comprehension in the regression model; however morphological awareness contributed directly to reading vocabulary, and reading vocabulary had a significant direct contribution to reading comprehension. The researchers concluded that reading vocabulary facilitated the contribution of morphological awareness to reading comprehension through an indirect path.

### 2.7.2. Research on Cross-Linguistic Relationships of L1 Morphological Awareness and L2 Reading Skills

There is limited research on the cross-linguistic relationship of morphological skills between the first and second language, and a majority of the research that has been done to date has centered on inflectional morphology (Gillis & Ravid, 2000; Jarvis & Odlin, 2000; Jia &

\(^{20}\) Woodcock Language Proficiency Battery – WLPB
Fuse, 2007; Wade-Woolley & Geva, 1998) and fails to address more robust data in derivational morphology. Moreover, the research that has considered derivational morphology has also varied in focus. Some studies have looked at compound structure awareness and its relation to word reading in Chinese and English (McBride-Chang et al., 2007; Wang et al., 2006), others have looked at cognate recognition and semantic overlap between derivational affixes in Dutch and English (Lowie, 2000) and Spanish and English (Nagy et al., 1993), some have focused on the role of morphological awareness in the prediction of word reading ability in Hebrew and English (Schiff & Calif, 2007) and English and Arabic (Saiegh-Haddad & Geva, 2008). In this section, I will review each of these studies and attempt to synthesize the findings.

Lowie (2000) examined semantic overlap between Dutch and English derivational affixes. The hypothesis was that a learner might benefit in acquisition of second language morphology when the two languages have similar affixes that contain the same semantic and syntactic properties (e.g. English –*able* and Dutch –*baar*); and when affixes exist with little semantic overlap, this might result in the learner’s confusion. The participants were Dutch learners of English attending various levels of English classes in secondary school. Participants’ scores were calculated based on tasks involving judgment on translation equivalence and productivity of the affixes as well as on a morphological production task. Results showed that translation equivalence played a major role in written production tasks at all levels of English, though the higher the proficiency, the higher the score on the translation equivalence. These findings suggest that the learners relied heavily on morphological knowledge in their L1 to perform in L2. Participant scores were low for affixes that did not have an equivalent counterpart in the L1.

A study of Chinese-English bilingual children by Wang et al. (2006) found that Chinese oral vocabulary and morphological tasks were significant predictors of Chinese character reading and reading comprehension in children in grades two, three, and four. The researchers gave a compounding task to measure morphological awareness in Chinese (similar to the *bee*
grass or grass bee task used by Nagy et al., 2003), and the production and decomposition tasks of morphologically derived words in both English and Chinese. In their study the researchers also found that for children in grades two to four, English compound morphological awareness contributed significantly to Chinese reading comprehension and Chinese character reading. They suggest that this cross-linguistic transfer may stem from the fact that both Chinese and English share the same compounding structure. Awareness of English derivational morphology did not transfer to Chinese reading, probably in part because Chinese only has very limited derivational structure. It is important to note that the direction of transfer in this study is from L2 English to L1 Chinese; and that this is the first time that this relationship has been shown.

McBride-Chang et al. (2007) found strong correlations between Chinese character reading and morphological structure awareness in bilingual Chinese-English kindergarten and second grade readers. Morphological awareness was significant to character reading even more so than phoneme deletion tasks and syllable deletion tasks. An example of a morphological awareness task asks: What would you call a game where you throw a ball into a bucket? [Bucketball]. The morphological task was also a significant predictor of vocabulary knowledge in Chinese in three different populations, in Beijing, Hong Kong and the United States. The morphological task contributed from 2 – 8% of the unique variance to vocabulary knowledge in each of the three groups. However, the morphological structure task failed to predict English word reading. The researchers claim that the design of the specific morphological task was limited to just compounding ability and does not capture the richness of English derivational morphology (McBride-Chang et al., 2007).

Schiff & Calif (2007) looked at the rich morphological root-based system of Hebrew. It has many consonantal sequences (three and four consonant clusters) that are from Hebrew and Arabic roots, which are unpronounceable on their own without vocalization. Of interesting note is the derivational component of these languages: it is both linear and non-linear, for example the root word K-T-B can form a word /hixtiv/ ‘dictated,’ similar to Arabic structure earlier
described where the root consonants ‘k’ ‘t’ and ‘b’ are inserted into the middle of the verbal affix hiCCiC (C represent a consonant); therefore hiKTiB becomes produced as [ hixtiv ]. This is a non-linear derivation because the affix is inserted in the middle of the root consonant structure; whereas in concatenative languages like English and Spanish, affixes are only attached in a linear fashion, either as prefixes or suffixes (not infixes). Schiff and Calif’s study (2007) was with fifth grade native Hebrew speakers that were learning English. They examined the role of phonological and morphological awareness in English (L2) oral word reading. In their measure of word reading, an interesting finding was that Hebrew morphological awareness as based on a morphologically relatedness task predicted English morphological awareness. The findings were that the more similar the features being analyzed, the stronger the correlations when analyzing only linear morphological derivations in both languages. Furthermore, Hebrew morphological awareness and phonological awareness also predicted English word reading. However, this relationship only held true when the morphological awareness scores were low; when scores were high, there was no correlation between L1 tasks and L2 word reading. In other words, low performers on morphological tasks in Hebrew were also low performers in English word reading, but high performers on Hebrew tasks were not shown to be high performers in English word reading.

In a study of morphological awareness and word reading in Arabic, Saiegh-Haddad and Geva (2008) found that children’s ability to decompose morphologically complex words and to identify morphological relatedness in pairs of words strongly correlated with oral language proficiency, and moderately correlated with Arabic word reading, Arabic pseudo word reading, and Arabic word reading fluency. The children in the study were in grades three – six and attended an English-Arabic bilingual private school. None of the children were native speakers of Arabic, though some of their parents did speak the language, suggesting that the children may have had some exposure to Arabic outside of school, which might improve their performance. Although the researchers found that morphological tasks in Arabic correlated with Arabic
measures of reading, they did not find any cross-language correlations in performance on the morphological tasks or in word reading abilities. That is, the Arabic morphological awareness measures did not predict English reading, or vice-versa. The researchers did find that within each language, the morphological tasks positively correlated with a syntax measure of oral language proficiency. Due to the fact that there was no transfer between the two languages, the researchers suggested that morphological awareness might be a language-specific skill that is independent in the two languages of bilingual children (Saiegh-Haddad & Geva, 2008).

Cross-linguistic research conducted with Spanish-speaking emergent English bilinguals and morphological awareness has been limited. The few studies that have been done have covered different aspects of this topic ranging from Spanish-English cognate recognition in text (e.g. Hancin-Bhatt & Nagy, 1994; Nagy et al., 1993), to the cross-linguistic relationship between L1 morphological awareness and L2 word reading (Ramírez et al., 2010). Only one study (Ramírez et al., 2013) considered the contribution of morphological awareness to reading comprehension across an emergent bilingual’s two languages.

Nagy et al. (1993) looked at recognition of cognates in Spanish-English bilinguals from fourth, fifth and sixth grades. The hypothesis proposed that if children are able to use cognate knowledge between Spanish and English, it could help them develop their English vocabularies. Based on vocabulary tasks and cognate recognition tasks in each language, the researchers found that the highest performance on English vocabulary tests was when the student knew the word in Spanish, and was able to identify the English word as a cognate. The findings suggest that there may be a degree of transfer from Spanish vocabulary knowledge to that of English; however, the transfer may only be active when the English words are recognized as cognates. Spanish-English cognates were defined with the adapted definition, i.e. words with similar sound, spelling and meaning, as described previously in the section on linguistic variables in this literature review. The researchers also found that sixth graders performed better than the fourth graders on such tasks, yet none of the participants reached anywhere near ceiling on the
assessments. All participants had an easier time recognizing cognate relationships when the orthographic representation was similar, even though many failed to see a relationship between examples such as Spanish *realidad* and English *reality*, which do have similarity in orthographic representation; furthermore, many English words ending in the derivational suffix –*ity* correspond to those in Spanish ending in -*idad*. The findings suggest that there may be a degree of transfer from Spanish vocabulary knowledge to that of English; however, the transfer may only be active when the English words are recognized as cognates and this skill seemed dependent on more extensive knowledge of derivational morphology.

In a follow-up study to this one, Hancin-Bhatt and Nagy (1994) looked at a population of fourth, sixth and eighth grade Spanish-English bilinguals and their ability to recognize cognates, using morphological awareness to recognize cognates when the derivational suffix did not have orthographic overlap (for example the English suffix –*ly* as in *quick+ly* does not have orthographic overlap with the Spanish suffix –*mente* as in *rápid+(a)mente*). They found that skills in recognizing cognates sharply increased between fourth and eighth grades, and that learners were able to recognize cognate stems rather than non-cognate stems in suffixed words in English. The second result may be attributed to the fact that when first developing morphological awareness in English, Spanish-speakers rely on their knowledge of Spanish roots, then subsequently develop a skill to recognize non-Latinate roots (or English roots that don’t have a similar Spanish equivalent).

Ramírez et al. (2010) tested Spanish-speaking emergent bilinguals in Canada in fourth & seventh grades to find out whether morphological awareness contributed to word reading in English. They used two measures of morphological awareness: one where students picked a morphologically derived word from four multiple choice options to complete a sentence. The second task was the production and derivation of morphologically complex words in sentences, which was also used by Kieffer & Lesaux (2008), but this time oral production of a morphologically derived word was required to complete the sentence. The researchers
correlated these measures to word reading\textsuperscript{21}. Like others (e.g. Abu-Rabia, 2007; Carlisle, 2000; Kieffer & Lesaux, 2008; Mahony et al., 2000; Nagy et al., 2003; Nagy et al., 2006; Wysocki & Jenkins, 1987), they did find a developmental increase in morphological awareness between fourth and seventh grade in morphological awareness, evidenced by the fact that the seventh graders outperformed the fourth graders on all tasks. They also found weak but significant correlations between morphological tasks and Spanish word reading, as well as morphological tasks and English word reading. Cross-language effects were seen in a relationship between Spanish morphological awareness and English word reading, but not from English to Spanish. One interesting finding was that Spanish morphological awareness had a more significant contribution to English word reading than English morphological awareness to English word reading. Furthermore, when cognates were taken out of the model of English word reading, Spanish morphological awareness still made a small, yet significant contribution to English word reading. Ramírez et al. (2010) attribute this finding to the complexity of Spanish morphology, which heightens sensitivity to morphemes, and therefore allows a contribution to English word reading over and above English morphological awareness. Their findings implicate many unanswered questions in the research on Spanish-English emergent bilinguals and the relationship between morphological awareness and reading, and call for more studies in some of the following areas:

1. Compare different aspects of morphological awareness – inflections, derivations, compounding, and linguistic features such as morphology, orthography, semantics, etc.

2. Compare bilinguals at different levels of proficiency in each language.

3. Investigate the effects of morphological awareness on vocabulary and reading comprehension (because until now studies have mostly focused on word reading).

To summarize, in the two language families that are most dissimilar to English, Chinese and the Semitic languages, the two studies presented in each language differed on their evidence

\textsuperscript{21} Word reading was measured with a sub-test from the Woodcock language Proficiency Battery.
of cross-linguistic relationships. One Chinese study, Wang et al. (2006) found evidence of transfer from L2 English awareness of compounding structure to L1 Chinese character reading. Although similar measures of morphological structure awareness were used in McBride-Chang et al.’s study (2007), the researchers failed to find evidence of transfer between Chinese morphological awareness and English word reading. It is unclear if they would have found evidence of transfer in the opposite direction. In the Semitic language studies, Schiff and Calif (2007) found that there was a positive correlation from Hebrew morphological awareness to English reading ability, but again in Saiegh-Haddad and Geva’s study (2008) between English and Arabic, there was no evidence of one language predicting awareness in the other. The differences in these studies may be the directionality of the predictions, or it may be due to the fact that different morphological tasks were administered. In the two studies on languages that are highly similar, namely Dutch-English and Spanish-English, the correlation results were both positive suggesting that the L1 seemed to be activated in processing L2 vocabulary. The claim that Schiff and Calif (2007) made – proposing that the more similar the two languages are in structure, the more likely the degree of transfer – may be true, but more evidence is necessary to fully support this conjecture.

2.8. Conclusions Leading to the Present Research

Drawing from suggestions in previous research comprehensively detailed above, the proposed research will attempt to add to the understanding of the role of morphological processes in reading. The first investigation in my research examines multiple linguistic variables within the morphological awareness tasks. One of the linguistic variables will provide more evidence on the debate on whether phonological awareness and morphological awareness exist as separate skills or if morphological awareness is an extension of and dependent on phonological awareness (cf Leong, 1989; Mahony et al., 2000). Frequency (e.g. Mahony et al., 2000) will be a second linguistic variable in this research. The third linguistic variable to be
included is that of cognate awareness, as more research is necessary to see what role recognition of cognates plays in morphological knowledge in English (following studies by Hancin-Bhatt & Nagy, 1994; Nagy et al., 1993; Ramírez et al. 2013).

The present study is unique in that none of the earlier studies on L2 morphological awareness in Spanish-English emergent bilinguals have looked at diversified morphological awareness tasks, including tasks that tap into both morpho-syntax and morpho-semantics, in relationship to text-level reading skills. Another distinctive factor in this study is the population that is being examined. It compares participants that are at the same age, yet different levels of proficiency in reading comprehension in L1 starting with very low to grade level literacy. The participants are older than those in most previous studies, adolescents in ninth and tenth grades and they are newcomer emergent bilinguals who have been in the United States for less than two years; this factor has not been controlled in previous cross-linguistic research. Other studies have looked at emergent bilinguals or bilinguals that have been in the country for at least three years (e.g. Goodwin et al., 2012; Kieffer & Lesaux, 2008; Ramírez et al., 2010, Ramírez et al., 2013). The dimensions of language ability significantly shift when more time is spent in the L2 environment. For example, newcomers are still dominant in their L1 whereas after three years being immersed in a new language, dominance may begin to shift from L1 to L2, at least in certain academic realms. In addition, there may be some language attrition within the L1 while L2 is being developed (depending on the home and school environments).

Previous studies in both L1 and L2 morphological awareness have mostly focused on the comparison of different age groups (Carlisle, 1988, 2000; Carlisle & Fleming, 2003; Katz, 2004; Kieffer & Lesaux, 2008; Nagy et al., 2003; Nagy et al., 2006; Ramírez et al., 2010) with the exception of a few studies that compared weak readers to strong readers in L1 (Fowler & Liberman, 1995; Leong, 1989). In those studies of comparison of weak to strong readers the students were all at younger ages, fourth – sixth grade and second- fourth grade, respectively. The present study compares low and high proficiency readers that are in ninth and tenth grades.
Finally, as Ramírez et al. (2013) pointed out, their study was the only one to date that has looked at the cross-linguistic contribution of Spanish morphological awareness to English reading comprehension. This current study will expand on their findings, and provide crucial information to help fill this gap in the literature. The formal study described in upcoming chapters was preceded by a pilot study, which is now described in Chapter 3.
3. **Pilot Study: Morphological Awareness in Reading for Low-literacy Adolescent Newcomers**

This chapter will examine a pilot study that I conducted on the relationship between L1 Spanish morphological awareness and L2 English reading comprehension with a group of low-literacy high school newcomers. The final section will draw together the findings from the literature review and my pilot study with a proposed theory for the cross-linguistic relationship of morphological awareness and reading comprehension. This theoretical model will lead into the current study that is outlined in subsequent chapters.

In an effort to look more closely at the cross-linguistic relationship between morphological awareness and reading comprehension, I conducted a pilot study using data from a larger research project on low-literacy Spanish-English emergent bilingual high school students in New York City (NYC)\(^{22}\). The pilot study looked at the relationship between morphological awareness, the mediating variable of morphologically complex reading vocabulary and the dependent variable of reading comprehension for two proficiency groups.

### 3.1. Pilot Study Research Questions

1) Within the L1 Spanish, is there a relationship between morphological awareness, morphologically complex reading vocabulary and reading comprehension for low-level readers and mid-level readers?

2) What are the strongest predictors of L2 English reading comprehension for two groups of SIFE, i.e. low-level readers and mid-level readers?

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\(^{22}\)The study on SIFE (Students with Interrupted Formal Education) was commissioned by the NYC Department of Education and was conducted by the principal investigators Elaine C. Klein and Gita Martohardjono. The data were collected during an 18-month longitudinal study involving five NYC high schools in four of the NYC boroughs. The purpose was to identify SIFE characteristics, and to develop a diagnostic tool to assess the skills that SIFE bring with them to NYC schools.
3.2. Pilot Study Participants

The participants in this study were 47 SIFE, from five NYC high schools. All were aged 14-18 and enrolled in ninth and tenth grades. All were newcomers to NYC (within 1-2 years) and were identified as SIFE by their schools. Participants were divided into two reading groups based on performance on the L1 Spanish reading comprehension section of the Academic Language and Literacy Diagnostic (ALLD):

1) Low-level readers = third grade and below\(^{23}\) (\(M\) grade level = 2.4, \(n = 25\))
2) Mid-level readers = fourth grade and fifth grade (\(M\) grade level = 4.7, \(n = 22\))

An independent samples t-test was conducted to compare the low-level readers and mid-level readers in L1 reading comprehension. The results revealed that the low-level (\(M = 47.48, SD = 11.77\)) and mid-level (\(M = 66.73, SD = 10.40\)) groups were statistically different in their performance on the Spanish ALLD; \(p = .000\). The decision to split the high group and low group between third and fourth grade comes from the pivotal research by Chall (1983) where the researcher suggested that this is the stage in which a developmental shift occurs in readers from the ‘learning to read’ to ‘reading to learn’ processes, and the evidence of increasing morphological awareness which begins around fourth grade.

3.3. Pilot Study Methodology

Trained research assistants working through the Second Language Acquisition Laboratory of the CUNY Graduate Center collected all of the data. Since the data were collected as part of a larger study, more information on the materials and procedures can be found in Garrison-Fletcher et al. (2008). The larger study, from which these data were taken, used a number of language and literacy measures; however, only those that are relevant to the pilot study are described here.

\(^{23}\) The diagnostic measurement started at 2\(^{nd}\) grade level. Some of the readers in the low group did not achieve 2\(^{nd}\) grade proficiency.
Morphological Awareness: The Word Study section of the ALLD was used to assess morphological awareness. This section of the ALLD was only given in the L1 Spanish; therefore there was no measure of morphological awareness in L2 English. Nine derivational morphology items were analyzed out of 12 total items in this section; three items assessed inflectional morphology and therefore were not of interest to this study. Of the nine items, five were compound words, two were prefixed morphologically derived words and two were suffixed morphologically derived words. The items in the Word Study section are all at fourth grade proficiency level.

Morphologically Complex Reading Vocabulary: To measure morphologically complex reading vocabulary, the Vocabulary section of the ALLD was used. In the Spanish vocabulary section, I had identified 14 of 30 (46.7%) total vocabulary items as morphologically complex (e.g., decoración) the rest of the items were monomorphemic words (e.g., pata). In English, 22 of 39 (56.4%) total items were identified as morphologically complex (e.g., abruptly), the remainder of the items were monomorphemic (e.g., sink). In sum, in each language roughly half of the vocabulary items assessed were morphologically complex words. The ALLD Vocabulary section given in Spanish and English was a cumulative assessment of multiple-choice questions across grades three to seven in Spanish and English with additional items from grades nine and eleven in English. The assessment in both languages contained three subsections: Synonyms, Multiple Meanings and Context Clues. A selection of morphologically complex vocabulary came from each of the three subsections.

Reading Comprehension: The ALLD Reading Comprehension section used in the pilot study was also cumulative, containing passages in Spanish from grade levels two to five and from grade levels two to seven and nine and eleven in English. Participants were asked to read a passage and answer multiple-choice questions about the passage. Reading passages were either

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24 One objective of the larger SIFE project was to develop diagnostic materials for incoming emergent bilinguals in NYC schools to identify SIFE. After the original ALLD was given in L1 at Time 1 of testing, many sections were revised, items added or deleted. The final version of the ALLD delivered to the NYC DOE included the Word Study Section.
informational (e.g. a passage about butterflies) or functional (e.g. a how-to on making the world’s most transparent book) and included questions that ranged from basic understanding to interpretation and critical analysis.

Data Analysis: In order to analyze these data, I ran bivariate correlations in SPSS to determine relationships between the independent variables (morphological awareness and morphologically complex reading vocabulary) and the dependent variable (reading comprehension). Next, I entered all related variables into a stepwise linear regression to find which independent variables were the best predictors of L2 English reading comprehension. I ran separate regressions for each of the two proficiency groups of readers.

3.4. Pilot Study Results

In this section, I present the results of the research questions for the pilot study on two groups of low-literacy emergent bilinguals in NYC. In order to answer the first research question, I looked at the relationship between Spanish morphological awareness, Spanish reading vocabulary and reading comprehension in Spanish, for the low and mid groups. I found that there was no direct relationship between morphological awareness and reading comprehension for either the low or mid group. Next, I looked at Spanish morphological awareness and Spanish reading vocabulary and found that there was no relationship for the low group. There was also no correlation between Spanish reading vocabulary and Spanish reading comprehension for the low group. The data suggest, however, that there was an indirect effect of Spanish morphology on Spanish reading comprehension for the mid group; there was a significant correlation between morphological awareness and reading vocabulary ($r = .445, p < .01$). The relationship between Spanish morphologically complex reading vocabulary and reading comprehension was also significant ($r = .628, p < .001$).

In order to answer the second research question, regarding predictors of L2 English reading comprehension for low and mid proficiency groups, I looked at the relationship between
the L1 morphological awareness variables and reading variables and the L2 reading vocabulary and reading comprehension measures. The correlational results are reported below in Table 3.1. The correlations are listed from the strongest to the weakest.

Table 3.1. Correlations to L2 English Reading Comprehension

<table>
<thead>
<tr>
<th></th>
<th>ALL</th>
<th>Low Group</th>
<th>Mid Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 Morphologically Complex Reading Vocabulary</td>
<td>.713**</td>
<td>---</td>
<td>.876**</td>
</tr>
<tr>
<td>L1 Reading Comprehension</td>
<td>.624**</td>
<td>.441*</td>
<td>.621**</td>
</tr>
<tr>
<td>L1 Morphologically Complex Reading Vocabulary</td>
<td>.588**</td>
<td>---</td>
<td>.753**</td>
</tr>
<tr>
<td>L1 Morphological Awareness (Word Study)</td>
<td>.485**</td>
<td>---</td>
<td>.566**</td>
</tr>
</tbody>
</table>

All correlations listed are significant (* = one-tailed significance $p < .01$, two-tailed significance ** = $p < .001$.)

In Table 3.1, the low group shows that the only measure that correlated with English reading comprehension was Spanish reading comprehension ($r = .441$, $p < .01$). In a follow-up stepwise regression, I found that L1 reading contribution contributed 17% of the variance to English reading comprehension. For the mid group, there was a very strong correlation ($r = .876$, $p < .001$) between English reading vocabulary and reading comprehension, and a strong correlation between Spanish reading vocabulary25 ($r = .753$, $p < .001$) and English reading comprehension. Spanish morphological awareness had a more moderate correlation with English reading comprehension ($r = .566$, $p < .001$); the correlation with Spanish reading comprehension is strong ($r = .621$, $p < .001$). A stepwise linear regression analysis revealed that the most significant predictor of L2 English reading comprehension was English morphologically complex reading vocabulary, which contributed 85% of the variance, and a small yet unique predictor was Spanish morphological awareness that contributed 7.3% of the variance.

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25 The majority of the morphologically derived items in the L2 vocabulary section were also Spanish cognates (16 out of 22 derived items were also cognates). In either case, however, morphological and cognate awareness both utilize skills of ‘morphological analysis,’ i.e. breaking down morphologically complex words into their individual parts in order to assign meaning to the word as a whole.
3.5. Pilot Study Discussion

This pilot shed light on the fact that the L1 readers performing at or below third grade level relied on different skills for reading comprehension than those who were L1 readers at or above fourth grade level. In terms of L1 Spanish reading comprehension, the most significant predictor for the mid group was morphologically complex reading vocabulary.

For the low group, there was actually a stronger correlation between monomorphemic vocabulary, i.e. the vocabulary items that did not fall under the category of morphologically complex, and reading comprehension in Spanish than for morphologically complex vocabulary and reading comprehension in Spanish. An example of a monomorphemic vocabulary item is *sink*, and a morphologically complex item is *diminutive*. The correlation was significant (*r* = .634, *p* < .01). This is probably because the low group has a greater knowledge of oral vocabulary, which is mostly inflectional and monomorphemic; therefore their low knowledge of complex derived forms does not correlate with L1 reading comprehension.

For L2 English reading comprehension, L1 Spanish reading comprehension correlated for both the low and mid reading groups. However, for the low reading comprehension group, L1 reading comprehension was the only significant contributor. For this low group Spanish is dominant and literacy is still at the ‘learning to read’ stages. Their morphological awareness is still developing as well: it seems to be at or below third grade level. This finding is in line with previous research on child readers below fourth grade, where there was little or no correlation between morphological tasks and reading comprehension.

For the mid group, however, these adolescents are reading at or above fourth grade, the age where previous research suggests a sharp increase in morphological skills (see, for example, Abu-Rabia, 2007; Carlisle, 2000; Kieffer & Lesaux, 2008; Mahony et al., 2000; Nagy et al., 2003; Nagy et al., 2006; Wysocki & Jenkins, 1987). For this group, the morphologically complex vocabulary that they have in L1 correlates to L1 reading comprehension, and the
morphologically complex vocabulary that they have in L2 has made a very strong contribution to their L2 English reading comprehension. The fact that there is overlap of cognates and derived words makes it hard to identify if it is the morphology of derivations or cognates that influences the relationship to L2 reading comprehension. In either case this group seems to be activating some morphological problem solving: identifying cognates requires identifying roots of words and assigning meaning from L1 knowledge, and assigning meaning to derived words also requires breaking down the words into parts to assign meaning to the whole word. Readers do not need to memorize each word in a derivational family of words, only the roots and frequent derivations; then they can figure out the meaning based on that knowledge (Nagy & Anderson, 1984).

This research suggests that there is great potential for low-level L1 readers to increase reading vocabulary (and subsequently reading comprehension) if this morphological skill of breaking down words through morphological problem solving is developed and focused on in school. Adolescents would have the chance to greatly increase reading vocabulary that is included in higher-level texts. One limitation to this study was that there were a small, similar number of items in the measure of morphological awareness; only nine items were included, all were from the fourth grade level, and the measure was only given in the L1 Spanish. Because of this limitation in the morphological awareness measure, it is difficult to draw any compelling conclusions on the relationship from morphological awareness to reading comprehension for these two populations of SIFE. The measure of morphologically complex reading vocabulary, however, did provide some significant results and avenues for further research. Because of the significant difference in performance of the two groups on morphologically complex reading vocabulary in L1, it would be beneficial to examine the individual linguistic variables within morphological awareness and reading vocabulary, i.e. those which may be inhibiting the performance of the low group on morphological awareness and knowledge, and therefore the connection to reading comprehension.
3.6. Theoretical Model of Morphological Awareness and Reading Comprehension

Considering the literature reviewed in Chapter 2, and the contribution of the pilot study, I propose a theoretical model of morphological awareness and reading comprehension, which shows the potential direct and indirect pathways from L1 morphological awareness to L2 reading comprehension taking into consideration reading vocabulary in L1 and L2. This is a simple view of reading that does not take into account the many complex factors involved; instead it focuses on just those variables that have been shown to relate to both morphological awareness and reading comprehension in the L1 and L2. The model in Figure 3.1 shows the theoretical paths between L1 morphological awareness and L2 reading comprehension, found in various studies in the literature.

**Figure 3.1 Theoretical Model of Morphological Awareness and Reading Comprehension**

The paths on this theoretical model are enumerated and discussed below:

1. The strongest relationship, between L1 reading comprehension and L2 reading comprehension, has been demonstrated many times in previous literature (see August & Shanahan, 2006; van Gelderen, Schoonen, Stoel, de Glopper & Hulstijn, 2007). More importantly, recent evidence proposes that L1 reading comprehension is a better predictor of
L2 reading comprehension than L2 reading vocabulary for high school emergent bilinguals (Garrison-Fletcher, 2012).

2. Multiple studies have also shown a more moderate yet significant relationship between L1 morphological awareness and L1 reading comprehension in English (Carlisle, 2000; Katz, 2004; Nagy et al., 2003; Nagy et al., 2006), and Ramírez (2009) has shown this relationship between L1 morphological awareness and L1 reading comprehension in Spanish.

3. Path three has been shown directly by Kieffer and Lesaux (2008) and indirectly through reading vocabulary (Goodwin et al., 2012); both indirect and direct paths have been established for the relationship between L2 morphological awareness and L2 reading comprehension for Spanish-Speaking emergent bilinguals at fifth grade. The pilot data presented in this chapter as well as other research has also established the path between L2 reading vocabulary and L2 reading comprehension (Carlo et al., 2004; Carlo et al., 2005).

4. The relationship between morphological awareness in L1 Spanish and L2 English was shown to exist in only some morphological tasks (Ramírez et al., 2010). The researchers found a significant correlation ($r = .52$) between Spanish and English morphological structure tasks (which were multiple-choice) but no correlation between Spanish and English morphological production tasks (fill in the blank).

5. Many studies have shown a relationship between morphological awareness and reading vocabulary in the L1 (Carlisle, 2000; Nagy et al., 2006; Wysocki & Jenkins, 1987).

6. The strong relationship between reading vocabulary and reading comprehension has also been established in L1 (Anderson & Freebody, 1981; Beck et al., 1987; Nagy & Anderson, 1984).

7. Ramírez et al. (2013) found that the cross-linguistic contribution of Spanish morphological awareness to English reading comprehension was only facilitated through cognate vocabulary in the English measure. The cognate measure also shows a relationship between L1 and L2 reading vocabulary (Nagy et al., 1993).
8. The only path that has not been evidenced in research is between L1 reading vocabulary and L2 reading comprehension.

Although many studies have shown that morphological awareness has made an independent contribution to reading comprehension, above and beyond that of vocabulary, it is also important to consider indirect routes. In their study of morphological awareness and literacy, Nagy et al. (2006) found that for the younger groups of participants, fourth/fifth graders, it seemed that the relationship between morphological awareness and reading comprehension was facilitated, i.e. indirectly, through vocabulary knowledge. For the older readers in their study, i.e. eighth/ninth graders, there was a more direct relationship from morphological awareness to reading comprehension (Nagy et al., 2006). Kieffer and Lesaux found similar results on emergent bilinguals between fourth and fifth grades (2008).

Through a series of multiple regression analyses, the current research will examine each of these pathways from Spanish morphological awareness to English reading comprehension in a single study that will test the theoretical model and the strength of each direct and indirect path. The analyses and paths that will be considered in the current study are described in more detail in the Chapters 4 and 5.
4. Research Questions and Hypotheses

In this chapter, I will describe the research questions and hypotheses for the present study. These questions were developed after reviewing the current literature on vocabulary development, morphological awareness and second language reading, as written in the previous chapter. The questions were investigated with the purpose of attempting to fill in gaps in what had been previously studied. Following the description of the research questions are the hypotheses I had developed for each question before carrying out the study, including gathering and analyzing the data. The following chapter describes the methodology used to answer the research questions, including information on the participants, measurement materials and analysis procedures.

4.1. Research Questions

There are two overarching research questions for this study. The first one examines the role of the linguistic variables that have been embedded into the morphological awareness measures created for this study to see whether these variables have any effect on morphological awareness, either inhibiting or aiding it. The second question looks at the relationship of morphological awareness to academic reading comprehension in both the L1 Spanish and the L2 English to determine what effect, if any, morphological awareness has on reading comprehension in the L1 and in the L2.

Research Question One: The Role of Linguistic Variables in Morphological Awareness in L1 and L2

1. To what degree do linguistic variables affect morphological awareness?
   a. What are the individual and interaction effects of linguistic variables, specifically cognates, derived word frequency, and phonological transparency in L1 Spanish?
b. What are the individual and interaction effects of linguistic variables, specifically cognates, derived word frequency, and phonological transparency in L2 English?

c. To what extent is morphological awareness affected by morpho-semantic and morpho-syntactic environments in the L1 and L2?

d. To what extent do linguistic variables and context in morphological awareness affect low and high L1 Spanish proficiency readers differently?

Questions 1 a) and b) ask whether three different variables have separate or joint effects on morphological awareness in first the L1 Spanish and then the L2 English. For example, the question will first address each variable independently, i.e. whether participants perform differently on morphological awareness items that are cognates or non-cognates, high or low frequency derived words, and phonologically transparent or opaque derived words. Next, the question addresses whether there is an interaction effect between the linguistic variables on morphological awareness in the L1 and in the L2. One example of a joint effect would be looking at the interaction of morphological items that are cognates, high frequency derived words and phonologically transparent at the same time, and whether that combination has a different effect on morphological awareness than other possible combinations. There are eight possible linguistic variable combinations, which will be discussed in more detail in Chapter 5.

Question 1 c) asks whether there is a difference in performance in L1 Spanish and L2 English on morphological awareness tasks that are in a morpho-semantic context (where focus is on the meaning of the morphologically related words) or a morpho-syntactic context (where focus is on the syntactic context of the sentence surrounding the morphologically derived words). In the literature reviewed in Chapter 2, it was shown that performance on tasks in the syntactic context were better indicators of reading comprehension than those in a semantic context (Katz, 2004).

Question 1 d) asks whether these same linguistic variables and contexts affect morphological awareness differently in those with higher reading proficiency in the L1 Spanish
and those with lower reading proficiency in the L1. The literature reviewed in Chapter 2, showed that there was a developmental progression in performance on morphological tasks from students in grade 2 through high school. This question asks whether there is an equivalent developmental progression for students who are all at the same high school age, but reading at different levels of proficiency (from second grade to eleventh grade) in their L1 Spanish.

These variables were selected because they were found in the literature (see Chapter 2) to affect morphological awareness. In other words, struggling readers and those at lower grade level proficiency had more difficulty with items that were not cognates from their first language, were lower frequency words, and those that had undergone a phonological shift (rendering them phonologically opaque) from the base word to the morphologically complex derived word. The present research question addresses these variables in a new context, i.e. with older readers at varying levels of proficiency; it also looks at the contribution of these variables to morphological awareness in L1 Spanish for the first time.

Research Question Two: The Effect of Morphological Awareness on Reading Comprehension in L1 and L2

2. To what degree does morphological awareness affect reading comprehension?
   a. What is the direct, indirect and total effect of morphological awareness in L1 Spanish on reading comprehension in the same L1 Spanish?
   b. What is the direct, indirect and total effect of morphological awareness in L2 English on reading comprehension in the same L2 English?
   c. What is the direct, indirect and total effect of morphological awareness in L1 Spanish on reading comprehension cross-linguistically in the L2 English?
   d. To what extent is the effect of morphological awareness on reading comprehension different for low versus high L1 proficiency readers?

Questions 2 a) and b) ask what the direct, indirect and total effect of morphological awareness is on reading comprehension in the L1 Spanish and then in the L2 English. Following
the Theoretical Model of the relationship of morphology to reading comprehension which was presented in Chapter 3, the question considers three possible paths from morphological awareness to reading comprehension, calculating: 1- the direct effect with no intervening or mediating variables, 2- the indirect effect through reading vocabulary as a mediating variable, and 3- the total effect of morphological awareness + reading vocabulary. Question 1 a) considers only the L1 Spanish variables of morphological awareness, reading vocabulary and reading comprehension while 2 b) replicates question 2 a) addressing only the L2 English variables of morphological awareness, reading vocabulary and reading comprehension.

Question 2 c) asks what is the direct, indirect and total effect of L1 Spanish morphological awareness on L2 English reading comprehension. This question is similar to those in 2 a) and b) in the predictors for reading comprehension. The difference for this question is that the predictors are both cross-linguistic and within-language. The analysis will look at the contribution of L1 Spanish reading variables (morphological awareness, reading vocabulary and reading comprehension) to L2 English reading variables (morphological awareness and reading vocabulary) and L2 English reading comprehension.

Research question 2 d) examines the relationship between morphological awareness and reading comprehension for two different groups of readers, low level L1 Spanish readers (second – fourth grade) and high level L1 Spanish readers (seventh – eleventh grade).

**Dependent and Independent Variables**

For both of the research questions there were separate analyses done for each language, L1 Spanish and L2 English. The dependent variables for research question one are morphological awareness in L1 and morphological awareness in L2, investigating the role of linguistic variables in morphological awareness. The dependent variables for research question two are reading comprehension in L1 and reading comprehension in L2, investigating the effect, through direct and indirect paths, of morphological awareness on reading comprehension.
The following are the independent variables in the study:

**Research Question One: L1 and L2 Independent Linguistic Variables**

- Cognate – Cognates / Non-cognates
- Derived Word Frequency – High / Low
- Phonological Transparency – Transparent / Opaque
- Linguistic Environment – Morpho-semantic / Morpho-syntactic

In other words, the predictor or independent variables for the dependent variable of morphological awareness in research question one are cognates, frequency, and phonological transparency. There were also two morpho-semantic and two morpho-syntactic tasks used in the study. The purpose of the independent variable of linguistic environment is to see the effect semantic and syntactic environments have on morphological awareness.

**Research Question Two: L1 and L2 Independent Reading Variables**

**L1 Reading Variables**
- Morphological awareness
- Reading vocabulary
- Reading comprehension

**L2 Reading Variables**
- Morphological awareness
- Reading vocabulary

For question two, the predictor or independent variables for the dependent variable of reading comprehension in L1 Spanish are L1 morphological awareness, and L1 reading vocabulary. When looking at the dependent variable of L2 English reading comprehension, the predictor or independent variables are L1 morphological awareness, L1 reading vocabulary, L1 reading comprehension, L2 morphological awareness and L2 reading vocabulary.

### 4.2. Hypotheses

In this section I will give a statement of hypothesis along with a rationale to support that hypothesis from the literature reviewed in Chapter 2. Hypotheses will be written for each of the sub-questions within the two overarching research questions on linguistic variables within
Hypotheses for Research Question One: The Role of Linguistic Variables in Morphological Awareness in L1 and L2

Summary of Hypotheses for Research Question One:

1. To what degree do linguistic variables affect morphological awareness?
   a. There will be no effects of cognates in the L1 Spanish; however there will be significant effects of derived word frequency and phonological transparency especially for low-level readers.
   b. There will be an effect of cognates in the L2 English especially for higher-level readers and there will be significant effects of derived word frequency and phonological transparency especially for lower-level readers.
   c. Participants will exhibit stronger performance on linguistic contexts that are morpho-semantic than those that are morpho-syntactic. Furthermore, participants will exhibit weaker performance in L2 English morpho-syntactic environments than L1.
   d. In terms of low versus higher proficiency readers, I expect that cognates will play more of a significant role for higher level readers, while low frequency, lower levels of phonological transparency, and syntactic linguistic context will impede morphological awareness for lower level readers, especially in the L2 English.

The first overarching question in this research is whether linguistic variables play a role in morphological awareness in L1 Spanish and L2 English. Research questions 1 a) – b) ask whether there are individual and/or interaction effects of three linguistic variables within the morphological awareness tasks, namely cognates, frequency of morphologically complex derived words, and phonological transparency. For research question 1 a) on the role of the three variables in Spanish, I do not expect cognates to play a significant role in Spanish morphological
awareness. The rationale for this is that due to participants’ limited exposure to English (within less than two full years in the U.S.), there would be little influence of L2 English on the L1 Spanish reading at this stage in their development. Other studies on cognates have only looked at the direction from L1 to L2 and not vice versa (Hancin-Bhatt & Nagy, 1994; Nagy et al., 1993; Ramírez et al., 2013). Because of the similarities between the two languages in frequency and phonological transparency (see examples in Chapter 2), I did expect that there would be effects of these variables in Spanish, particularly for the low-level readers. To my knowledge there have been no studies that have looked specifically at the role of frequency and phonological transparency in Spanish for morphological awareness; therefore my hypothesis that these variables would play a significant role in morphological awareness is based on the similarity between Spanish and English word formation processes and the fact that significant effects of these variables have been found in English (Fowler & Liberman, 1995; Leong, 1989).

For each of the linguistic variables in English for research question 1 b) I would expect that performance on one would be stronger than the other; for example, I hypothesize that participants would perform better on cognates than non-cognates, high frequency over low frequency morphologically complex derived words, and phonologically transparent more so than phonologically opaque derivations. The rationale behind this hypothesis that all three linguistic variables will have an effect on morphological awareness is reviewed in the literature in Chapter 2 where cognate recognition was significant for Spanish-English bilingual readers (Hancin-Bhatt & Nagy, 1994; Nagy et al., 1993; Ramírez et al., 2013), lack of phonological transparency posed a problem for reading comprehension especially for lower level readers (Fowler & Liberman, 1995; Leong, 1989; Windsor, 2000) and frequency effects were witnessed as well (Katz, 2004; Mahony et al., 2000).

Based on the evidence of developmental stages in morphological awareness I hypothesize for question 1 c), which asks about the differences in linguistic environment for morphological awareness, that participants will perform better on morphological tasks that

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involve relational knowledge than those that are in syntactic environments (see Katz, 2004; Tyler & Nagy, 1989). Furthermore, I expect morpho-syntactic knowledge and ability to be lower in English because the reading proficiency level of this group of emergent bilinguals is still at the beginning stages.

Question1 d) asks whether different patterns emerge between lower proficiency readers in the L1 Spanish and higher proficiency readers on the effects of linguistic variables and the different linguistic environments. I hypothesize that the high group will outperform the low group on all morphological awareness measures in both L1 and L2. This hypothesis was due to evidence in developmental trends in morphological awareness, where ability increased with age and reading proficiency (Abu-Rabia, 2007; Carlisle, 2000; Kieffer & Lesaux, 2008; Mahony et al., 2000; Nagy et al., 2003; Nagy et al., 2006; Wysocki & Jenkins, 1987). I am hypothesizing that the developmental trend is more closely related to reading ability than age; this will be the first study of its kind to provide such empirical evidence. Again, based on studies reviewed in Chapter 2, I hypothesize that the high group would be able to make more use of the cognates in English than the low group. Hancin-Bhatt and Nagy (1994) found that bilingual eighth graders with higher reading proficiency outperformed bilingual fourth graders on cognate recognition in context, although they recognized some caveats that the eighth grade group was mostly born outside of the U.S. while the younger cohort was mostly born in the U.S., and other factors such as reading proficiency were not controlled for. I hypothesize that the low group would struggle more with low frequency words and those that were phonologically opaque than the high group would.
Hypotheses for Research Question Two: The Effect of Morphological Awareness on Reading Comprehension in L1 and L2

Summary of Hypotheses for Research Question Two:

2. To what degree does morphological awareness affect reading comprehension?

   a. Morphological awareness will have a direct effect on reading comprehension in the L1 Spanish.

   b. There will be both a direct and indirect effect of morphological awareness on reading comprehension in L2 English.

   c. There will be no direct effect of L1 morphological awareness on reading comprehension in the L2 English; however, due to multiple indirect paths, there will be a strong total effect of L1 morphological awareness on L2 reading comprehension.

   d. There will be a stronger effect of L1 morphological awareness on L2 reading comprehension for the higher-level readers than for the lower-level readers, because the former group will be able to transfer more skills from L1 reading ability.

   For question 2 a), which asks whether there would be a direct, indirect or total effect of morphological awareness on reading comprehension in L1 Spanish, I expected that 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. Ramírez (2009) was able to show a relationship between morphological awareness and reading comprehension in Spanish for her cohort of fourth and seventh grade emergent bilinguals.

   For question 2 b) regarding the direct, indirect and total effects of morphological awareness on reading comprehension in English, I also expected that there would be both a direct effect and an indirect effect of morphological awareness on reading comprehension in
English because that has also been previously shown with Spanish-English emergent bilinguals (Kieffer & Lesaux, 2008).

The question of cross-linguistic relationships is raised in question 2 c). For the analysis of morphological awareness to reading comprehension, I hypothesize that while there may be no direct 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. In the only study to look at this relationship between Spanish and English, an indirect effect was found, facilitated through cognates (Ramírez et al., 2013).

For question 2 d) I hypothesized that there would be different effects of morphological awareness on reading comprehension in L1 and L2 for low and higher level readers. For instance, I hypothesize that because the higher-level readers have more L1 literacy skills, they will be able to transfer skills from their L1 Spanish (e.g. Alderson, 1984; Cummins, 1991). I expect that the higher-level readers will be able to make use of cognates in English, and not be as impeded by lack of frequency and phonological opacity as the low readers, and therefore will be able to contribute their L1 morphological awareness skills to English reading more so than the low-level readers.
5. Methodology

In this chapter I will provide information on the characteristics of the participants that are reported on in the present study, give both an overview and a detailed description of the materials used in the study (e.g. reading measures and morphological awareness assessments), and finally provide a description of and rationale for the data analyses used to investigate the research questions previously stated in Chapter 4.

5.1. Participants

The participants investigated in this study are 88 emergent bilinguals that were newcomers in the New York City school system at the time of the study. All had arrived to the U.S. within two years of the beginning of the study and were enrolled in ninth and tenth grades in one Bronx high school. The majority was ninth graders who had been in school in the U.S. for two months or less (62.5%); the remainder had been in U.S. schools no longer than 14 months (36.4%)\(^{26}\). Their ages ranged from 15 to 20 years \((M = 17.4, SD = 1.2; 50\) males and 38 females). All reported Spanish as their first language and were mostly from the Dominican Republic (88.6%); the others were from Honduras (4.5%), Ecuador (3.4%), Mexico (1.1%) and Colombia (1.1%).

As a sub-analysis of each major research question in the study, two groups were pulled out from the larger group, one reading at a low level in their L1 Spanish, and one reading at a higher level in their L1 Spanish. (Measurements used to determine reading proficiency are described below.) A summary of the characteristics of the participants in the low and high groups follows in Table 5.1. The participants in the current study exhibit a large range in L1 reading ability, and therefore differ from those in the pilot study described in Chapter 3, which investigated all low-literacy emergent bilinguals.

\(^{26}\) Data were missing from the school for one student; therefore the background information reported here is based on 87 of the 88 total participants.
Table 5.1. Summary of Low and High Participant Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Participants</th>
<th>L1 Reading Proficiency Range by Grade Level (M)</th>
<th>Age Range in Years (M)</th>
<th>Enrolled Grades (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>28</td>
<td>2nd – 4th Grade (2.8)</td>
<td>15 – 20 (17.4)</td>
<td>9th (63.0%) 10th (37.0%)</td>
</tr>
<tr>
<td>High</td>
<td>27</td>
<td>7th – 11th Grade (8.6)</td>
<td>16 – 20 (17.4)</td>
<td>9th (59.3%) 10th (40.7%)</td>
</tr>
</tbody>
</table>

The reason for examining these two sub-groups in more detail is because previous research suggests that there is a developmental shift, where skills significantly increase in morphological awareness somewhere between fourth and sixth grade reading proficiency level (see Chapter 2 for more details). In addition to the increase in morphological awareness after grade four, a fundamental shift in reading ability also occurs at this stage according to Chall (1983), where readers move from ‘learning to read’ to ‘reading to learn.’ The summary provided in Table 5.1 suggests there were roughly equal numbers of participants in each sub-group (28 low and 27 high). The mean reading grade level in Spanish for the low group was 2.8 with no reader at above a fourth grade proficiency, and for the higher group the mean was 8.6, with a range of levels from seventh to eleventh grade. The labels of low and high readers were chosen to simply delineate two statistically significant groups at the lower and higher ends of the spectrum within the total population of ninth and tenth grade newcomers. While there is no question that the low group is in fact ‘low,’ ninth and tenth graders reading at fourth grade and below in the L1, the ‘high’ group had a mean reading level in the L1 which was slightly below ninth grade level. I argue that this is still a realistic high group for a New York population, given the fact that in a standardized eighth grade reading assessment in the state, only 35% of eighth-graders were reading at or above eighth grade proficiency in English (Dept. of Education, 2011). In fact, the diversity in L1 reading ability is indicative of typical emergent bilingual classrooms across the U.S., and is a good representation of one of the challenges educators face with this population. Both the low and high groups had a mean age of 17.4, and for both groups the majority of students were enrolled in ninth grade (63% of the low group and 59% of the high group).
5.2. Materials

The materials for this study can be divided into three general categories: 1- Control Measures – to control for confounding variables with the independent and dependent variable measurements, 2- Reading Measures – to measure the mediating and dependent variables, and 3- Morphological Awareness Measures – to measure the independent, or predictor, variables.

All materials are listed in Table 5.2, with an explanation of their purpose, source, and example of format. Because the morphological awareness measures were developed specifically for this study and were not standardized, I conducted a baseline analysis for validation of these measures.

<table>
<thead>
<tr>
<th>Variable Type</th>
<th>Measurement</th>
<th>Language</th>
<th>Description</th>
<th>Source</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Background Questionnaire</td>
<td>Spanish</td>
<td>RISLUS</td>
<td>Group, oral + written</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Syntactic Structures Assessment</td>
<td>Spanish</td>
<td>RISLUS</td>
<td>Group, oral + written, multiple-choice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oral Vocabulary</td>
<td>Spanish</td>
<td>Batería III (Riverside)</td>
<td>Individual, oral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test of Working Memory</td>
<td>Spanish</td>
<td>Batería III (Riverside)</td>
<td>Individual, oral</td>
<td></td>
</tr>
<tr>
<td>Reading (Dependent and Mediating Variables)</td>
<td>ALLD Reading Comprehension</td>
<td>Spanish and English</td>
<td>RISLUS / NYC DOE (Pearson)</td>
<td>Group, written, multiple-choice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALLD Reading Vocabulary</td>
<td>Spanish and English</td>
<td>RISLUS / NYC DOE (Pearson)</td>
<td>Group, written, multiple-choice</td>
<td></td>
</tr>
<tr>
<td>Morphological Awareness (Independent Variables)</td>
<td>ALLD Word Study</td>
<td>Spanish and English</td>
<td>RISLUS / NYC DOE (Pearson)</td>
<td>Group, written, multiple-choice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Morphological Relatedness Task (MRT)</td>
<td>Spanish and English</td>
<td>Researcher-created</td>
<td>Group, oral + written, yes/no</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test of Morphological Structure (TMS)</td>
<td>Spanish and English</td>
<td>Researcher-created</td>
<td>Group, oral + written, fill-in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test of Syntactic Categories (SynCat)</td>
<td>Spanish and English</td>
<td>Researcher-created</td>
<td>Group, oral + written, multiple-choice</td>
<td></td>
</tr>
</tbody>
</table>
5.2.1. Control Measures

I used four control measures in this study: a background questionnaire to control variation in demographic background, two measures of typical language development in the first language, Spanish, and one measure of working memory. Typical language development measures are used to ensure that the participants have met age-appropriate benchmarks in non-academic language in the L1.

**Background Questionnaire:** An 8-item written questionnaire, developed by a team of researchers at the Research Institute for Language in Urban Society (RISLUS), was administered to all students. It was used to control for age, place of birth, age of arrival to the U.S., language background and any history of prior missed schooling. The questions were read aloud to the group of participants in their L1 Spanish, and they were asked to fill in the information individually while the researchers walked around the room offering help to those who needed it.

**Test of Syntactic Structures:** This syntax test was given in L1 Spanish to control for typical language development, and to identify any participants that fell below that typical range, which might be an indication of a language or cognitive impairment. The syntactic structures in this test have been established as benchmarks in first language development by English-speaking monolinguals and are generally mastered by age 10 (Hsu, Cairns, & Fiengo, 1985). The test was developed by RISLUS to serve the purpose of assessing syntactic knowledge independently from vocabulary knowledge. The sentences in the test contain complex syntactic structures, e.g. subject and object coordination, and embedded relative clauses, which are often found in academic texts. In this group assessment, the students heard a sentence two times and were asked to select one of three pictures that best matched the sentence. The participants completed four practice items before completing the 22 test items.

**Oral Vocabulary:** In the L1 Spanish, we gave a sub-test from the *Batería III* (Riverside Publishing) called Picture Vocabulary. This assessment is designed for native Spanish-speakers,
and is a norm-referenced measure. It measures aspects of oral language and lexical development. The purpose of this measure in the current study was to control for deficits in oral vocabulary that might underlie morphological awareness, i.e. to make sure that the morphological awareness items were not just a test of vocabulary. The assessment is cumulative and appropriate for ages two through 90+. The participant is assessed individually with the administrator and testing continues until six consecutive items are answered incorrectly. This sub-test is scored with software from the publisher based on age and grade norms in cognitive-academic language proficiency (CALP). For this study, the assessment was given to a random sampling of the population (about 40 participants) in Spanish. Participants looked at pictures and were asked to give an oral response using an appropriate vocabulary word to describe the picture. Items become increasingly more difficult as the assessment continues and move from more everyday words to academic ones.

**Test of Working Memory:** The reverse number recall task from the *Bateria III* (Riverside Publishing) was administered individually in Spanish to eliminate any findings that might mistake a deficit in cognitive ability with that in reading ability. Like the oral vocabulary assessment, this task was administered to a random subset of about 40 participants to insure that there were no general problems with working memory within the population. A problem with working memory could in theory be the underlying reason for low literacy in the low group. In this task, a series of numbers were read to the participant, who was instructed to repeat the number series back to the administrator in reverse order. This measures the participants’ ability to hold a series of numbers in short-term memory before repeating them back in reverse order. Similar to the oral vocabulary sub-test, this assessment is appropriate for participants aged two through 90+ and is scored based on age and grade norms using scoring software from the publisher.
5.2.2. Reading Measures

The reading measures were used as independent, mediating, and dependent variables in research question two, investigating the direct, indirect and total effects of morphological awareness on reading comprehension in L1 Spanish and L2 English.

For both Spanish and English reading comprehension, reading vocabulary and word study, I used a measurement called the Academic Language and Literacy Diagnostic (ALLD). The ALLD is a tool that was developed by RISLUS in collaboration with the New York City Department Of Education and Pearson publishers in order to determine native language reading proficiency for Spanish-speaking newcomer emergent bilinguals at the middle and high school level. The Spanish items were adapted from Pearson’s standardized assessment *Aprenda 3: La prueba de logros en español, Tercera edición* and the English items were adapted from Pearson’s *Stanford Achievement Test, Tenth edition*. The ALLD is a cumulative assessment that includes items from the second to eleventh grade levels.

**Reading Comprehension:** Reading comprehension is considered the dependent variable for the analyses of research question two; in L1 Spanish for the within-language L1 analysis and in L2 English for the within-language L2 analysis as well as the cross-linguistic analysis. The reading comprehension section of the ALLD includes items from all grade levels starting at two through seven, and includes items from grades nine and eleven. It follows standard reading comprehension passage format, requiring students to read a passage, then 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 (i.e. directly found in a given text) to being more analytical, including strategies and other higher-level text skills (e.g. including making inferences from a given text). For each language, students read one sample passage to themselves while the administrator reads it aloud; then the students answer related questions. The answers to the sample passage are shared and discussed with the group before
moving on to the assessment passages. The assessment continues with a total of eight test passages and 38 related questions (an average of four to five questions per passage).

**Reading Vocabulary:** Reading vocabulary in L1 Spanish and L2 English is considered a mediating variable between morphological awareness and reading comprehension in the multiple regression path analysis (described below). The measurement was taken from the Reading Vocabulary section of the *ALLD*. The reading vocabulary measurement includes three subsections: multiple meanings, context clues and synonyms. Each of these subsections relates to the depth of vocabulary knowledge necessary for high-level reading skills. The *ALLD* Vocabulary section was given as a group assessment in Spanish and English. It is a cumulative assessment of multiple-choice questions across grades three to seven, then nine and eleven with a total of 39 items in each language. Out of 39 total items in English, 23 of these items (59.0%) were Spanish cognates. Although cognates within English reading vocabulary have been suggested to operate as a mediating variable (Ramírez et al., 2013), a large number of cognate items on this measurement were also morphologically complex words in English\(^\text{27}\). Because these two linguistic features of cognates and morphologically complex words can be confounded, the entire reading vocabulary subsection (cognates and non-cognates) was considered the mediating variable.

### 5.2.3. Morphological Awareness Measures

The independent variable measure of morphological awareness was developed specifically for this study, following previous research in the field. The present study included four measures of morphological awareness: two on morpho-semantic context and two focused on morpho-syntactic context. 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). (These measures

\(^{27}\) Due to different etymological viewpoints on word formation within colleagues in the CUNY linguistics department, the exact number of morphologically complex words in the sample was not determined.
are described below.) All morphological awareness measures were given in both L1 Spanish and L2 English.

With the exception of Word Study, which is a section of the previously developed ALLD, linguistic variables were embedded in a systematic way into the researcher-created morphological awareness measures. All English morphological awareness tasks had an equal number of each binary feature of each linguistic variable of cognates / non-cognates, high / low frequency derived words and phonologically transparent / phonologically opaque derived words. The Spanish morphological tasks were created to mimic the English tasks; however in order to maintain similarity in vocabulary and the number of cognates, there were not exact numbers of high and low frequency and phonologically transparent and opaque items.

Table 5.3 below summarizes the independent linguistic variables of cognate, frequency and transparency, which were analyzed in this study to investigate research question one: the role of linguistic variables in morphological awareness.

Table 5.3. Summary of Linguistic Variables in Spanish and English

<table>
<thead>
<tr>
<th>Linguistic Variable</th>
<th>Binary Features</th>
<th>L1 Spanish Examples</th>
<th>L2 English Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognate</td>
<td>Cognate stem + cognate suffix</td>
<td>famoso</td>
<td>famous</td>
</tr>
<tr>
<td></td>
<td>Non-cognate stem + non-cognate or cognate suffix</td>
<td>casamiento</td>
<td>marriage</td>
</tr>
<tr>
<td>Derived Word Frequency</td>
<td>High frequency derived word</td>
<td>posibilidad</td>
<td>education</td>
</tr>
<tr>
<td></td>
<td>Low frequency derived word</td>
<td>cuidadoso</td>
<td>curiosity</td>
</tr>
<tr>
<td>Phonological Transparency</td>
<td>Transparent: No phonological shift, with or without orthographic shift</td>
<td>poder – poderoso</td>
<td>four – fourth</td>
</tr>
<tr>
<td></td>
<td>Opaque: Phonological Shift – consonant or vowel, (stress shift)</td>
<td>decidir – decisión</td>
<td>sign – signature</td>
</tr>
</tbody>
</table>

28 Stress shift was only considered an opaque feature in English, not Spanish. In English, stress shift was usually accompanied by an alternating vowel. In Spanish, stress regularly shifts at the addition of a morpheme.
Cognate: All items in the morphological awareness tasks used in this study were either tagged as cognates or non-cognates, with an equal number of each throughout. In order to be considered cognates in this study, I used a definition adapted from the traditional linguistic definition\textsuperscript{29}, i.e. words from Spanish and English that have similar sound, spelling and related meaning. Furthermore, in the derived form, I only included cognates that had both stems and affixes that were both cognates. Likewise, for non-cognates the words had stems and affixes that were both non-cognates. A combination of a cognate stem + non-cognate suffix was not included in this study\textsuperscript{30}.

Frequency of Derived Words: All morphologically complex, derived items in the morphological awareness tasks were either assigned the feature of high frequency or low frequency. I determined the frequency of each test item by looking at the frequency of the morphologically derived, complex word. There are a number of ways frequency could be accounted for: frequency of the base or root word, frequency of the derivational affix, or frequency of the morphologically complex word as a whole. I chose to look at the whole word because the entire morphologically complex word is what the reader is experiencing within the text. English items were considered high frequency if they appeared more than 50 times per million words in the MRC Psycholinguistic Database (Wilson, 1988). Spanish item frequency was determined using *A Frequency Dictionary of Spanish* (Davies, 2006). Spanish items that had no entry in the frequency dictionary were considered low frequency.

Phonological Transparency: All morphologically complex, derived items in the morphological awareness tasks were also assigned a feature of either phonologically transparent or phonologically opaque. Phonologically transparent items had no change in phonological representation from the base monomorphemic form to the morphologically complex, derived

\textsuperscript{29} More information on the definition of *cognate* can be found in Chapter 2.
\textsuperscript{30} The present research acknowledges that there may be different degrees of perception of cognates, and does not consider false cognates. The validation of materials via a collection of baseline data, referred to in this chapter, was an attempt to minimize this variable within the current study.
word. Items were considered phonologically transparent as well if there was a change in orthography with no change in phonological representation. Items were considered phonologically opaque if there were any vowel and/or consonant changes from the base monomorphemic form to the morphologically complex, derived word.

In order to cut down on the total number of linguistic variables in the morphological tasks, the full list of phonological shift conditions presented in Chapter 2, Table 2.2. was collapsed into just two phonological conditions in the present research: phonologically transparent and phonologically opaque31.

**Morpho-Semantic Measurements**

Word Study Skills (ALLD): 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. Unlike other subsections of the ALLD, which are cumulative, all Word Study items were on the fourth grade level. The sub-test was broken down into two sections, one of which included four compound words, and the other having two morphologically complex words with derivational prefixes and two with derivational suffixes; there were a total of eight Word Study items considered for this research. The purpose of the first task in the Word Study section (ALLD) is to recognize compound words, which involves the understanding of how to affix two free morphemes together. In an English example, participants would be given the choices: *classroom*, *about*, and *honey* and asked to choose the compound word *classroom*. In Spanish, they would choose the compound word *parabrisas* ‘windshield’ from the items *parabrisas* ‘windshield’, *sobre* ‘above’ and *milla* ‘mile.’ Since the items were all at a fourth grade reading level, they were all high frequency words.

The purpose of the second task in Word Study (ALLD) is to determine awareness of meanings of individual morphemes in morphologically derived words. An English example asks,

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31 In order to have a sound statistical analysis, increasing the number of linguistic variables would also mean increasing the total number of test items, which would not have been feasible with the current population of students.
“In the word submarine, sub probably means – a) very b) under c) not.” An analogous Spanish example asks “En la palabra submarino, sub probablemente significa – a) muy b) bajo c) no.” In administration of the Word Study, participants were asked to read the example item silently as the administrator read it aloud. After the example item was discussed, the participants completed the test items on their own in the same manner. Each of the two subsections in Word Study includes one example item.

**Morphological Relatedness Test (MRT):** This task was originally developed by Derwing (1976) and was known as the “comes from” task (as described in Chapter 2). It has been used in more recent studies on morphological awareness in reading (Mahony, 1994; Mahony et al., 2000). Derwing’s participants included children, adolescents and adults who were asked to judge whether pairs of words were semantically related and were instructed to give a response on a five-point scale of how closely they were related. The items were related on different levels of phonological transparency, kitty -> cat (opaque), and semantic transparency skin -> skinny (distantly related). This measure was purely to determine the participants’ relational knowledge of morpheme families, not within a reading context. Derwing (1976) concluded that recognition of morphologically related words increases as semantic and phonetic similarity increase and that morpheme recognition is more highly related to semantic similarity than to phonetic similarity. Also the ability to recognize morphologically related words and reject unrelated words strengthened with age.

The first purpose of the relational task for the present study is to determine if there is the same increase in relational knowledge between participants at reading proficiency levels (not just age as Derwing found) below grade four and above grade six. The second purpose is to see if there is an effect of relational knowledge in morphology to reading comprehension. The word pairs in the English version of the present study were adapted from Derwing (1976), Mahony (1994) and Mahony et al. (2000). With assistance from native Spanish-speaking colleagues, I created an equivalent version in Spanish for this study. The procedure of the MRT task was such
that pairs of words were read aloud as participants read along silently. The participants were then asked if the second word “comes from” the first word, and if they had a similar meaning. The participants were directed to circle YES if they believed the items were related or NO if they believed they were not related. Three example items were presented in each language prior to the test items; the answer for the first example was marked for them. Participants were encouraged to ask questions as necessary on the example items in order to understand how to complete the task. An example related pair in English includes happy and happiness; a related pair in Spanish includes feliz ‘happy’ and felicidad ‘happiness.’ An example of an unrelated pair in English is cat and category and in Spanish is mal ‘bad or evil’ and maleta ‘suitcase.’

There were a total of 100 items in each language; 56 were morphologically related and 44 were not. The number of morphologically related items exceeded that of non-related items because there was greater variation within the morphologically related items in terms of linguistic features. The English and Spanish MRT versions had the same composition of embedded linguistic features: Of the 56 English related items, half were created with one linguistic feature according to the linguistic hierarchy of linguistic variables and the other half were created so that they belonged to the opposite linguistic feature. In other words, there were 28 items of each feature in all three of the binary linguistic categories: 28 cognates / 28 non-cognates, 28 high frequency / 28 low frequency, and 28 phonologically transparent / 28 phonologically opaque.

**Morpho-Syntactic Measurements**

**Test of Morphological Structure (TMS):** Carlisle (2000) adapted this test from Leong (1989) to assess students’ awareness of the relation of base and derived forms in context. She used suffixes that were judged to be familiar among third and fifth graders: -th, -ance/ence, -er, -ity, -tion/sion, -ous, -able. Carlisle (2000) notes that this task of structural analysis would be more closely related to students’ ability to define morphologically complex words than a
relational task, such as the MRT. In the TMS, participants are given a word and then asked to change that word to best fit a given sentence. Some sentences require the participant to produce a morphologically complex derived word from a base word (production), and others require the participant to break down a morphologically complex word into its base form (decomposition). An example of production in English is, “Success: The woman’s career was very [successful].” A decomposition example in English is, “Originality: That painting is the [original].” The decomposition test follows the same format as one used by Goodwin et al. (2012), which they validated on a group of third and fifth grade monolingual English speakers and Spanish-speaking emergent bilinguals.

The purpose of the TMS in the current study is to assess participants’ ability to produce or decompose morphologically complex words, with the aid of syntactic context clues. The ability to manipulate morphologically complex words in context has been shown to be a good predictor of reading comprehension. The version of the TMS, which I developed for this study, contained 12 production items and 12 decomposition items of morphologically complex words. In the current study, Spanish production and decomposition items were generally transadaptations of the English32, e.g. Production: “Éxito: La mujer tenía una profesión muy [exitoso]” and Decomposition: “Originalidad: Ese cuadro es el [original].” Some of the English items in this task were adapted from Carlisle (2000) and some Spanish items were taken directly from Ramírez et al.’s (2010) task with permission from the author (Ramírez, 2010). There were three example items in each language; one decomposition item with the answer filled in, one production item and one more decomposition item. Once the administrator completed going over the example items, she read the prompt word and the corresponding sentence to the students while they read along silently. The students were then asked to fill in the blank in the sentence with a form of the prompt word that best matched the sentence. In the

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32 Transadaptation is the process of translation taking into consideration cultural and linguistic differences.
present study, the TMS contains 24 total items in English and 24 in Spanish. Within the English set, 12 items were cognates and 12 were not. Following the structure of the linguistic hierarchy, of the cognates and non-cognates in each subset, 6 were high frequency words and 6 were low frequency words. Within each set of high and low frequency words, 3 items were phonologically transparent and 3 items were phonologically opaque. Within the Spanish TMS set, 12 items were English cognates and 12 were not. For frequency of the morphologically complex derived words, 16 were considered high frequency and 8 were considered low frequency; 11 of the items were phonologically transparent and 13 were phonologically opaque.

**Syntactic Categories** *(SynCat-Real / SynCat-Nonce)*: This test was first developed by Mahony (1994) and similar measures used by Nagy et al. (2003) to measure the participant’s knowledge of syntactic categories of common derivational suffixes of Latin and Greek origins. Mahony’s test was given to high school aged advanced placement students from a middle class high school in Southern California and to undergraduate students from UC Irvine. Ramírez et al. (2010) adapted this test to their population of emergent bilinguals in fourth and seventh grade in both English and Spanish. Because this test requires only knowledge of the syntactic structure, or the morpho-syntactic structure of the word to complete the sentence, it does not require vocabulary knowledge. In the current study, the SynCat test was designed with both real word items and nonsense items. The assessment included a nonsense word section to assess awareness of how real morphological suffixes on nonsense words fit into syntactic environments without the pretext of vocabulary knowledge.

In the final morphological awareness task for the present study, SynCat, the participants were read a sentence with a word missing, while they read along silently. They were then asked to read the four word choices and choose the best one that matched the sentence to fill in the blank. For example: English, “His __________ changed as he got older. a) personify b) personal c) personality d) personalize” and Spanish, “Su __________ cambia con la edad. a) personificar b) personal c) personalidad d) personalizar.” The purpose of this assessment in
the present study is to assess comprehension of how morphologically derived complex words fit into syntactic structures. This assessment is different from the TMS in that it assesses the participants with multiple-choice format instead of requiring the participants to produce the correct item via fill-in-the-blank, a more difficult task. The test was made up of 24 items of real word morphologically complex items and 10 nonsense word items. The nonsense items were comprised of a real morphological affix attached to a nonsense stem. Analogous examples from SynCat-Nonce English and Spanish are as follows, “Every living thing has its own __________ a) torbature b) torbativize c) torbatable d) torbatify,” and “Cada ser vivo tiene su propia __________ a) peticura b) peticuramiento c) peticuración d) peticural.” Whenever possible, the SynCat-Real English and Spanish items were transadaptions of each other. The SynCat-Real section included three example items, with the answer marked for the first example item. The SynCat-Nonce section included one additional example item. The items in the present study were adapted from two previous ones that used this measure in English and Spanish (Mahony, 1994 and Ramírez, 2010, respectively).

In the present study, The English SynCat-Real test contained 24 items, 12 of which were Spanish cognates and 12 were non-cognates. Within each set of 12 there were 6 high frequency items and 6 low frequency items. Finally, within the high and low frequency items, 3 of each were transparent and 3 were opaque. The Spanish SynCat-Real also contained 12 English cognates and 12 non-cognates. There were 15 high frequency Spanish morphologically complex items and 9 low frequency morphologically complex items. The Spanish also contained 15 phonologically transparent items and 9 phonologically opaque items. There were 10 nonsense items in each language which were not included in the analysis of linguistic variables.
5.3. Validity of Morphological Awareness Measurements

I conducted a baseline study of the morphological awareness assessments on native Spanish and native English speakers for the Spanish and English morphological assessments, respectively. The reason for collecting this baseline data is because some of the answers to items on the morphological awareness tasks could be construed as subjective. For example, theoretically there is room for disagreement in the relatedness task depending on how the reader interprets relationships between words, e.g. thinking about analysis of etymology or considering current modern definitions of words.

For each test language I collected data from a group of undergraduate and graduate students from various colleges within the City University of New York (CUNY) who were native speakers of each test language. Native language proficiency, age, and whether the native language was developed at home or at school was self-reported and collected in writing prior to administration of the assessment. I excluded graduate students that were enrolled in the Linguistics program to minimize likelihood that the baseline participants would spend time using linguistic knowledge to analyze the test items. Table 5.4 below shows the results of the baseline study on participants’ performance on the tasks.

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33 IRB approval was obtained in order to conduct this baseline study, under the project title, “Morphological Awareness in Spanish-English Bilinguals.”
Table 5.4. Summary of Baseline Data in Spanish and English on All Morphological Awareness Assessments

<table>
<thead>
<tr>
<th>Participant Group</th>
<th>Mean Raw Score (SD) N = 158</th>
<th>Mean % Correct (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Spanish (n = 5)</td>
<td>134.4 (20.1)</td>
<td>93.6 (4.9)</td>
</tr>
<tr>
<td>Graduate Spanish (n = 5)</td>
<td>147.0 (5.6)</td>
<td>93.8 (1.9)</td>
</tr>
<tr>
<td>Total Spanish (n = 10)</td>
<td>140.7 (15.4)</td>
<td>93.8 (3.5)</td>
</tr>
<tr>
<td>Undergraduate English (n = 8)</td>
<td>152.4 (4.4)</td>
<td>97.3 (2.3)</td>
</tr>
<tr>
<td>Graduate English (n = 15)</td>
<td>154.6 (3.2)</td>
<td>98.4 (1.5)</td>
</tr>
<tr>
<td>Total English (n = 23)</td>
<td>153.8 (3.7)</td>
<td>98.0 (1.8)</td>
</tr>
</tbody>
</table>

There were a total of 10 participants that completed the baseline Spanish morphological assessments (5 undergraduate and 5 graduate). In looking at the total native Spanish group, the mean score was 93.8%. In English, there were a total of 23 participants (8 undergraduate and 15 graduate) that completed the baseline morphological awareness assessments. The native English group the mean score was 98.0%. In the two languages, the participants in both the undergraduate and graduate groups scored well above 90% on the assessments. The graduate students in both Spanish and English outperformed the undergraduates and had a smaller range of scores. The native English speaker baseline score was higher than the native Spanish speaker baseline score (98.0% to 93.8% respectively). The reason for this discrepancy is most likely because within the Spanish-speaking population sampled many had acquired Spanish at home while attending school in the U.S. in English, and had either limited or no prior schooling in Spanish.

5.4. Testing Procedures

All analyses in this project were done using data that were collected for a larger project under the title “Understanding the Student with Interrupted Formal Education (SIFE)” (Klein &
Martohardjono, 2010). Trained research assistants were certified on administration of each of the measurements before collecting the data. Data collection occurred on three school days; the first day was a Friday, the second day was the following Thursday and the third day was the Friday of that same week. On the first day, data were collected in the L1 Spanish, the second day in L2 English, while the third day was dedicated to individual assessments in both languages. On the first two testing days, each test section was administered in one class period to a group of approximately 15-20 students per classroom. The group sessions included the test sections: 1) Background Questionnaire, ALLD Vocabulary and ALLD Word Study, 2) ALLD Reading Comprehension, and 3) Morphological Awareness tasks and Test of Syntactic Structures.

Bilingual research assistants, fluent in Spanish, administered the Spanish tests. During the third session, the participants were pulled from their regular class schedule to complete the individual assessments, i.e. Oral Vocabulary and Working memory. The participants were given the individual assessments in Spanish and English by two different researchers; some received the L1 Spanish assessments first and others first received the L2 English assessments.

5.5. Data Analyses

**Exploratory Analysis with Control Measures:** Descriptive statistics were calculated using means and standard deviations for all of the control measures, including the three assessments in the L1 Spanish: test of syntactic structures, oral vocabulary and working memory. Next, using SPSS generated scatter plots, results on the control measures were examined to show outliers and determine if any participants should be excluded from the study. Participants performing below age-expected levels on the control measures in the L1 Spanish were excluded from the data analyses for the research questions.

**Research Question One – The Role of Linguistic Variables in Morphological Awareness in L1 and L2:** Questions 1 parts a) and b) are concerned with individual and interaction effects of three linguistic variables within morphological awareness in L1 Spanish and L2 English, namely
cognate, phonological transparency and frequency. In order to examine the role of these linguistic variables, the data were first organized in SPSS to calculate means and standard deviations for performance on each of the linguistic variables. The same procedures were done for L1 Spanish and L2 English separately. Within each language, each linguistic variable was put into a paired samples t-test in SPSS to determine if there were any significant differences between the contrasting features of the variables (e.g. cognates and non-cognates). If a significant difference was found within the binary variable pairs, the data were then analyzed using repeated-measures ANOVA in a General Linear Model in SPSS. This allowed me to see if there were interactions between the variables, assuming the variable hierarchy. The linguistic variable hierarchy allows us to see that there are eight possible variable combinations for each language, as shown in Figure 5.1.

**Figure 5.1. Hierarchy of Linguistic Variables in L1 Spanish and L2 English**

1. Cognate – High Frequency – Phonologically Transparent
2. Cognate – High Frequency – Phonologically Opaque
3. Cognate – Low Frequency – Phonologically Transparent
4. Cognate – Low Frequency – Phonologically Opaque
5. Non-Cognate – High Frequency – Phonologically Transparent
6. Non-Cognate – High Frequency – Phonologically Opaque
7. Non-Cognate – Low Frequency – Phonologically Transparent
8. Non-Cognate – Low Frequency – Phonologically Opaque

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**Linguistic Variables in L2 English**

```
Cognate
  | High Frequency
  |    | Phonologically Transparent
  |    | Phonologically Opaque
  | Low Frequency
  |    | Phonologically Transparent
  |    | Phonologically Opaque
```

```
Non-Cognate
  | High Frequency
  |    | Phonologically Transparent
  |    | Phonologically Opaque
  | Low Frequency
  |    | Phonologically Transparent
  |    | Phonologically Opaque
```
Each of the eight linguistic variable combinations was explored for its interaction effects on the outcome of the morphological awareness in L1 Spanish and then again in L2 English in order to answer the research questions 1 a) and b).

Research question 1 c) asks how the two linguistic environments of morpho-semantics and morpho-syntax affect morphological awareness in L1 and L2. In order to answer this question, the means and standard deviations were calculated for each sub-group of morphological awareness tests in L1 and L2, that is morpho-semantic tests and morpho-syntactic tests. Next, a t-test was done to see if there were any significant differences found between performance on one kind of assessment versus the other.

Question 1 d) asks whether linguistic variables and the linguistic environment of the morphological assessment had any significantly different effects on low-proficiency Spanish readers and high-proficiency Spanish readers. I used the same analyses from questions 1 a-c) on these two sub-populations of the total student group.

Research Question Two – The Effect of Morphological Awareness on Reading Comprehension in L1 and L2: For the analysis of the second research question, I first looked at the descriptive results of the morphological awareness tasks and the reading tasks by calculating means and standard deviations in SPSS. For the reading vocabulary and reading comprehension tests, I looked at both mean grade level and mean percent correct. The mean grade level score was used to divide the participants into high and low groups. Next, I ran simple bivariate Pearson correlations in SPSS between the independent and dependent variables to establish relationships between the reading variables and the morphological awareness variables. For all of the independent and dependent variables, I used the mean percent correct, a continuous variable, instead of mean grade level, which does not show as much of a range in scores as percent correct.
In analysis of questions 2 a – c), this study takes a path approach to determining the effect of morphological awareness on reading comprehension. Instead of looking only at the 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). Researchers have increasingly been looking at different forms of path models, e.g. structural equation modeling, and regression path models, which account for how all of the mediating variables on the theoretical path proposed are causally related (e.g. see Kieffer & Box, 2013; Kieffer & Lesaux, 2012; Zhang & Koda, 2011). 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. The path model shows more than the correlations between the variables because it can be an indicator of directionality and causality. It also is able to give us much more than just sequential or simultaneous regression because we are able to see the direct and indirect effects and the indirect effects are particularly useful in explaining how an total effect works (Keith, 2006); therefore we can see how the intervening or mediating variables help us to understand how an effect comes about. In order to answer the research questions 2 a) and 2 b) to determine the direct, indirect and total effect of morphological awareness on reading comprehension in L1 and L2, the variables were put into a series of multiple regressions to show the strength of the paths between the independent, mediating and dependent variables and which were the direct and indirect effects of those independent variables on reading comprehension.

The same path analysis process was used to answer the question 2 c) which asks what the direct, indirect and total effects are on the cross-linguistic path from L1 morphological awareness to L2 reading comprehension. Question 2 d) is a response to questions 2 a – c) that compares outcomes for low and high groups of participants.
Comparison of Low and High Spanish Reading Proficiency Groups: After the high and low groups were established based on their L1 Spanish reading comprehension ALLD grade level scores, I calculated the mean percent correct for each group on the independent and dependent variables. I then conducted an analysis of variance (ANOVA) in SPSS to determine if there were differences between the two participant groups (high and low) in both L1 reading comprehension (to establish that these were indeed distinct groups, i.e. to avoid a Type 1 error and not assume that they were different) and also in L1 morphological awareness (to determine if there was a developmental trend in L1 Spanish, as has been shown in English).
6. Results

In this chapter, I will present the results from the current study. First, I will look at the findings from the control measures on L1 syntax, L1 oral vocabulary and working memory. These results were used to identify any participants who appeared to have underlying language delays or cognitive deficits that might contribute to poor reading skills in the first language, and thus exclude them from the study. The next section will address the results for Research Question One in regard to the role of linguistic variables in morphological awareness in the L1 Spanish and L2 English. The final section will present the results from Research Question Two, which examines the contribution of morphological awareness to reading comprehension in L1 Spanish and L2 English.

A total of 105 students participated in this study. See Table 6.1 for the total number of participants that completed each assessment in the study.

Table 6.1. Number of Participants that Completed Each Assessment

<table>
<thead>
<tr>
<th>Assessments</th>
<th>Number of Participants that Completed Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Spanish Picture Vocabulary, <em>Batería III</em></td>
<td>40</td>
</tr>
<tr>
<td>Spanish Working Memory, <em>Batería III</em></td>
<td>41</td>
</tr>
<tr>
<td>Spanish Test of Syntactic Structures, <em>RISLUS</em></td>
<td>103</td>
</tr>
<tr>
<td><strong>Reading Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Spanish <em>ALLD</em> Reading Comprehension</td>
<td>102</td>
</tr>
<tr>
<td>Spanish <em>ALLD</em> Reading Vocabulary</td>
<td>94</td>
</tr>
<tr>
<td>English <em>ALLD</em> Reading Comprehension</td>
<td>94</td>
</tr>
<tr>
<td>English <em>ALLD</em> Reading Vocabulary</td>
<td>90</td>
</tr>
<tr>
<td><strong>Morphological Awareness Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Spanish <em>ALLD</em> Word Study</td>
<td>101</td>
</tr>
<tr>
<td>Spanish Morphologically Relatedness Test (MRT)</td>
<td>99</td>
</tr>
<tr>
<td>Spanish Test of Morphological Structure (TMS)</td>
<td>93</td>
</tr>
<tr>
<td>Spanish Test of Syntactic Categories (SynCat) Real / Nonce</td>
<td>101 / 99</td>
</tr>
<tr>
<td>English <em>ALLD</em> Word Study</td>
<td>91</td>
</tr>
<tr>
<td>English Morphologically Relatedness Test (MRT)</td>
<td>89</td>
</tr>
<tr>
<td>English Test of Morphological Structure (TMS)</td>
<td>63</td>
</tr>
<tr>
<td>English Test of Syntactic Categories (SynCat) Real / Nonce</td>
<td>88 / 83</td>
</tr>
</tbody>
</table>
Testing was completed in three school days with no scheduled days for make-up tests; therefore many of the participants were absent or missing from class during the administration of certain subsections of the tests and as a result different numbers of participants completed each test. The two individually-administered control measures had the smallest sample sizes due to lack of time for individual administration; these assessments represent a sample of the total population, or roughly 45% of the 88 students included in the study. With the exception of the English Test of Morphological Structure (TMS), at least 83 participants completed each group-administered assessment. Fewer participants were able to complete the English TMS because of its difficulty: It required the participant to fill in the blank in a sentence frame by manipulating a morphologically complex word that was provided to them. Since the majority of participants had been in the U.S. for only two months at the time of the study, many (28%) were not able to complete this section with their limited knowledge of English. The other assessments given in English were either in Yes/No or Multiple-Choice format, and therefore did not pose the same problem as the English TMS.

6.1. Results for Control Measures

Three control measures in the L1 Spanish were used in this study: two measured typical language development (or age-appropriate language structures), and one was used to assess age-appropriate cognitive ability via a test of working memory. Table 6.2. lists the descriptive statistics for all control measures.
Table 6.2. Descriptive Results for L1 Control Measures: Syntactic Structures, Oral Vocabulary and Working Memory

<table>
<thead>
<tr>
<th>L1 Spanish Control Measures</th>
<th>N</th>
<th>Mean % Correct (SD)</th>
<th>Grade Level (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test of Syntactic Structures</td>
<td>103</td>
<td>87.5 (10.5)</td>
<td>NA</td>
</tr>
<tr>
<td>Oral Vocabulary</td>
<td>40</td>
<td>71.4 (8.8)</td>
<td>6.6 (2.5)</td>
</tr>
<tr>
<td>Working Memory</td>
<td>41</td>
<td>NA^34 (3.0)</td>
<td>3.4 (3.0)</td>
</tr>
</tbody>
</table>

**Spanish Test of Syntactic Structures**

This control measure, as described in Chapter 4, was used to assess typical language development in the L1 Spanish, which is important so as to exclude those participants that might have a language deficit that could potentially contribute to low reading ability. There were 103 participants who completed the *RISLUS* Test of Syntactic Structures in the L1 Spanish. The majority of participants scored within the expected range considered for typical language development in L1 syntactic structures. There were four participants who were identified as outliers, having scored well below the mean (88%) at 41%, 43%, 52% and 53%. Figure 5.1 shows the outliers on a scatter plot with a comparison of percent correct on the *RISLUS* Test of Syntactic Structures and grade level achieved on the *ALLD* Spanish Reading Comprehension Assessment. All four of the outliers scored at second grade level on the *ALLD* Spanish Reading Comprehension sub-test. The scatter plot shows that many other participants who scored at the second grade level on the reading comprehension assessment did score within age-appropriate levels on the Test of Syntactic Structures (from 75 – 100%). This confirms that the four participants with below range scores on the syntactic structures assessment were indeed outliers, motivating their exclusion from the study.

^34 Working Memory was calculated as a raw score of $M=10$, $SD=2.9$. The scoring software did not calculate percent correct scores for working memory.
Once the outliers were removed, 99 participants remained who had completed the syntactic structures assessment with scores ranging from 69% to 100% ($M = 89$, $SD = 6.7$), an appropriate range to be considered for participation in the study.

**Spanish Oral Vocabulary**

There were 40 participants who completed the test of Spanish Picture Vocabulary from *Batería III*, described in Chapter 4. I used this test to measure oral vocabulary, which is a known predictor of reading ability. A deficit in oral vocabulary might be an indicator of a language delay and could potentially undermine the other measures of reading ability used in the study. Scoring software from the publisher was used to calculate the percent correct and grade level equivalency for each participant. Participants scoring more than three grade levels, i.e. below sixth grade level, in the L1 would have been considered outliers as such a low oral vocabulary score might confound the morphological awareness and other reading skills results. All
participants in this study scored within the sixth to seventh grade level of the oral vocabulary assessment, with a mean percent correct of 71 ($SD = 8.8$). The mean score in Spanish L1 was below the expected ninth grade level by approximately two to three years. Considering that this is an assessment of cognitive-academic language proficiency in L1 Spanish and not simply non-academic oral vocabulary, this result was to be expected for this population and does not indicate that there were deficits in typical oral language development. There were no outliers determined as a result of this test.

**Working Memory**

This working memory assessment, described in Chapter 4, was used to measure age-appropriate cognitive ability. Similar to the other control measures used, poor working memory is known to be an indicator of poor reading ability; therefore if a participant were assessed with a low working memory on this task, it could confound the results of the reading measures used in the following research questions. A total of 41 participants completed the reverse number recall section of the *Batería III* in the L1 Spanish. Scoring software from the publisher was used to generate descriptive results for this assessment and they are reported in the form of grade level in Table 6.2 above. Because the low grade-level result ($M = 3.4$) was unexpected, I took a closer look at the individual scores for working memory and arranged the participants into three categories of scores: below average, low-average and above-average\(^{35}\). Out of the 41 participants who completed the assessment, three scored above-average (above ninth grade), three scored at low-average (mid-eighth grade) and the remaining 35 scored below average (below eighth grade). A cross-examination of *ALLD* Spanish Reading Comprehension grade level and category achieved on working memory suggests that there is no relationship between those that scored below average on working memory and their reading comprehension ability in the L1 Spanish. Those that scored below average in working memory exhibit the full range in L1 reading comprehension scores from second to eleventh grade, while those that scored at both

\(^{35}\) These categories were established by Garrison-Fletcher (2012) in a previous study with these data.
low-average and above-average levels ranged in reading comprehension scores from fourth to eleventh grade. These results are represented in the scatter plot in Figure 6.2 below.

**Figure 6.2. Scatter Plot of % Correct on Working Memory and Spanish Reading Comprehension Grade Level**

While these results were unexpected, they are not surprising. Due to limited space available in the school during administration of the individual assessments, as many as three or four students were being tested in a classroom at one time with overlapping conversations. Some students were also assessed in the main office of the school where background noise and other distractions were present. It seems that the results on this test are unreliable due to poor testing conditions, and in this case are no indication of the participants’ true cognitive ability. If testing conditions had been better, this test would have been a reliable measure of working memory or cognitive deficits that could potentially confound the results in the measures of reading skills. This same test has been used in previous research as a reliable measure on similar low-literacy high school newcomers in New York City, where researchers found that 78% of the
students tested had average working memories, suggesting there were no cognitive deficits in this population (Garrison-Fletcher et al., 2008).

Using the RISLUS Test of Syntactic Structures in Spanish to identify four participants as outliers, I subtracted four outliers from the original 105 to equal 101 participants. Out of the 101 eligible participants, 88 were identified as having completed the necessary assessments to perform the analyses in the main research questions for the current study. In the following sections, the analyses will report on these 88 participants.

6.2. Results for Research Question One – The Role of Linguistic Variables in Morphological Awareness in L1 and L2

In this section I will present the results for the statistical measures used to analyze the role of linguistic variables in morphological awareness in L1 Spanish and L2 English, the difference in performance in a semantic or syntactic environment, and the differences that emerge between low and high groups. The main question analyzed in this section is:

To what degree do linguistic variables affect morphological awareness?

By linguistic variables I am referring to the three binary variables that were described in detail in Chapter 5, namely cognates/non-cognates, high/low frequency of morphologically derived words and phonologically transparent/phonologically opaque morphologically derived words. There are also two linguistic environments that I will look at in this section: morpho-semantic and morpho-syntactic. Table 6.3 provides the descriptive statistics for the morphological awareness measures used in both languages, providing a broad picture of the results for research question one.
Table 6.3. Descriptive Results for L1 (n = 81) and L2 (n = 55) Morphological Awareness Measures

<table>
<thead>
<tr>
<th>Morphological Awareness Measures</th>
<th>L1 Spanish (n=81) Mean % Correct (SD)</th>
<th>L2 English (n=55) Mean % Correct (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Morphological Awareness Tasks</td>
<td>79.3 (10.5)</td>
<td>51.9 (15.5)</td>
</tr>
<tr>
<td>All Morpho-Semantic Environments</td>
<td>83.2 (9.8)</td>
<td>68.6 (15.4)</td>
</tr>
<tr>
<td>ALLD Word Study</td>
<td>77.9 (17.1)</td>
<td>64.3 (26.2)</td>
</tr>
<tr>
<td>Morphologically Relatedness Task (MRT)</td>
<td>88.3 (5.8)</td>
<td>72.6 (9.9)</td>
</tr>
<tr>
<td>All Morpho-Syntactic Environments</td>
<td>76.8 (13.7)</td>
<td>41.3 (17.7)</td>
</tr>
<tr>
<td>Test of Morphological Structure (TMS)</td>
<td>85.8 (13.5)</td>
<td>36.5 (24.3)</td>
</tr>
<tr>
<td>Test of Syntactic Categories – Real</td>
<td>85.3 (13.7)</td>
<td>47.4 (19.6)</td>
</tr>
<tr>
<td>Test of Syntactic Categories – Nonce</td>
<td>59.6 (24.2)</td>
<td>38.9 (19.3)</td>
</tr>
</tbody>
</table>

As expected, participants performed better on all of the morphological awareness tasks in the L1 Spanish than in L2 English with a composite morphological awareness mean score of 79% in Spanish (n = 81) and 52% in English (n = 55). The English results represent a smaller percentage of the total population of participants due to the fact that many were not able to complete the Test of Morphological Structure, which required students to fill in the blank in a sentence after manipulating a given word to fit the sentence with one that was morphologically related.

After looking at the means and standard deviations for all of the various morphological awareness tasks, I calculated the mean and standard deviations for each of the linguistic variables within the tasks. In other words I calculated a composite score for all cognates/non-cognates, high/low frequency, and phonologically transparent/opaque items that were represented in each of the three researcher-created morphological awareness tasks: Morphologically Relatedness task, Test of Morphological Structure, and the Test of Syntactic Categories-Real. These linguistic variable descriptive results are represented in Table 6.4 below.
The descriptive results in L1 Spanish on linguistic variables suggest that there were not very big differences between the linguistic variables, where the mean score was also above 80% on all of the measures. In L2 English, notable differences are between cognates ($M = 59\%$) and non-cognates ($M = 45\%$), and high ($M = 56\%$) and low frequency ($M = 48\%$). The difference between phonologically transparent ($M = 53\%$) and opaque ($M = 51\%$) was not as prominent. A further exploration of significant differences in these variables, and between high and low reading groups are reported below in response to the sub-questions on the role of linguistic variables in morphological awareness.

### a. What are the individual and interaction effects of linguistic variables, such as cognates, derived word frequency, and phonological transparency in L1 Spanish?

First using a paired samples t-test in SPSS, I further investigated the relationship between each of the binary variables (cognates, derived word frequency and phonological transparency) in L1 Spanish to determine the individual effects of the variables. There was a significant difference in performance between the cognates and non-cognates in Spanish ($t (80) = 5.66, p = .000$) with a higher mean on cognates ($M = 86.3, SD = 9.6$) than non-cognates ($M = 82.9, SD = 10.7$). However the differences noted in the frequency or phonological transparency variables did not reach significance. With regard to interaction effects, a repeated-measures ANOVA confirmed that there were no interaction effects between the variables.
b. What are the individual and interaction effects of linguistic variables, such as cognates, derived word frequency, and phonological transparency in L2 English?

In the L2, English, significant differences were found using a paired samples t-test between cognates and non-cognates \((t (54) = 11.50, p = .000)\), and high and low frequency derived words \((t (54) = 6.72, p = .000)\). There was no significant difference for the whole group between those words that had undergone a phonological shift in the derivation from the base form to the derived form (phonologically opaque) and those that had no shift condition from base form to derived form (phonologically transparent).

To determine if there were any interaction effects between the variables, I entered all eight of the linguistic variable combinations into a repeated-measures ANOVA in SPSS (see Chapter 5 for details). There were interaction effects noticed between the levels of cognates-high frequency-phonologically opaque and cognates-low-frequency-phonologically transparent, \((F (1)= 34.665, p = .000)\). This result suggests that participants performed better on items that were cognates and high frequency, even though they were phonologically opaque, than those items that were cognates and low frequency that were phonologically transparent. This result further suggests that frequency is more important than phonological transparency on this level where items are all cognates.

There was also a significant interaction effect \((F (1)= 51.551, p = .000)\) on items that were all cognates and low frequency, but differed in phonological transparency. This means that for those items that were cognates, but low frequency there was a significant difference between the phonologically transparent and opaque items. There were no individual effects of phonological transparency; however this interaction effect suggests that frequency and transparency together do have a role in morphological awareness. The third interaction effect again showed that phonological transparency was significant \((F (1)= 102.848, p = .000)\), that is when the items were all non-cognates and high frequency, they only differed with respect to phonological transparency.
c. To what extent is morphological awareness affected by morpho-semantic and morpho-syntactic environments in the L1 and L2?

In order to answer question 1 c), I administered a series of assessments in both semantic and syntactic environments, the results of which are shown above in Table 6.3. I also used a paired samples t-test to find differences between the morpho-semantic and morpho-syntactic environments in the L1 Spanish and then again in the L2 English. Results showed in L1 Spanish that participants performed significantly better ($t(80) = 4.49, p = .000$) on the tasks within the morpho-semantic environments ($M = 83.2, SD = 9.8$) than those that were within morpho-syntactic environments ($M = 76.8, SD = 13.7$). The same was true of L2 English: Participants performed significantly better ($t(54) = 13.41, p = .000$) on the tasks within the morpho-semantic environments ($M = 68.6, SD = 15.4$) than those that were within morpho-syntactic environments ($M = 41.3, SD = 17.7$).

A final sub-analysis to research question one asked:

d. To what extent do linguistic variables and context in morphological awareness affect low and high L1 proficiency readers differently?

The descriptive results for the low and high L1 proficiency readers are displayed in Table 6.5 below. This table includes their mean scores on each of the sub-tests of morphological awareness measures and those in semantic and syntactic environments.
Table 6.5. Descriptive Results for L1 Low (n = 24) and High (n = 26) and L2 Low (n = 13) and High (n = 21) Morphological Awareness Measures

<table>
<thead>
<tr>
<th>Morphological Awareness Measures</th>
<th>L1 Spanish Mean % Correct (SD)</th>
<th>L2 English Mean % Correct (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (n = 24)</td>
<td>High (n = 26)</td>
</tr>
<tr>
<td>All Morphological Awareness Tasks</td>
<td>72.5 (10.0)</td>
<td>86.4 (7.3)</td>
</tr>
<tr>
<td>All Morpho-Semantic Environments</td>
<td>78.3 (10.3)</td>
<td>87.0 (9.4)</td>
</tr>
<tr>
<td>ALLD Word Study</td>
<td>69.2 (20.2)</td>
<td>83.2 (15.4)</td>
</tr>
<tr>
<td>Morphologically Relatedness Task (MRT)</td>
<td>87.1 (5.2)</td>
<td>90.6 (5.1)</td>
</tr>
<tr>
<td>All Morpho-Syntactic Environments</td>
<td>68.6 (12.6)</td>
<td>86.0 (9.3)</td>
</tr>
<tr>
<td>Test of Morphological Structure (TMS)</td>
<td>81.4 (15.2)</td>
<td>89.0 (11.3)</td>
</tr>
<tr>
<td>Test of Syntactic Categories – Real</td>
<td>79.0 (17.3)</td>
<td>90.5 (7.6)</td>
</tr>
<tr>
<td>Test of Syntactic Categories – Nonce</td>
<td>45.8 (15.9)</td>
<td>78.9 (15.6)</td>
</tr>
</tbody>
</table>

The descriptive results that are presented here in Table 6.5 show that there is a developmental trend in the data where the higher proficiency group outperformed the low group on all measures of morphological awareness in both the L1 Spanish as well as the L2 English. There is also evidence to support the claim that relational knowledge is easier than morphology in syntactic structures (Tyler & Nagy, 1989) in that all participant groups performed better on the relational tasks than the syntactic tasks in both the L1 Spanish and L2 English. The only exception is for the high group in Spanish, and the reason for this is probably because on both tests this group had high scores, semantics 87.0% and syntax 86.0%. However, for example, there was a significance of the relational tests over the syntactic environments in the results for each of the other groups: Low group in L1 Spanish ($t (23) = 3.696, p = .001$) and low group in L2 English ($t (12) = 5.447 p = .000$). There was a significant difference between the morpho-semantic and morpho-syntactic environments for the high group in L2 English ($t (20) =12.097 p = .000$) as well.
Table 6.6 below shows the descriptive results for the linguistic variables of cognate, frequency and phonological transparency for the low and high proficiency groups of readers.

Table 6.6. Descriptive Results for Linguistic Variables of Cognate, Frequency and Phonological Transparency Comparison of Low and High Groups

<table>
<thead>
<tr>
<th></th>
<th>Mean % Correct (SD)</th>
<th>Mean % Correct (SD)</th>
<th>Mean % Correct (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cognates Non-</td>
<td>High Frequency</td>
<td>Low Frequency</td>
</tr>
<tr>
<td></td>
<td>Cognates Non-</td>
<td>Frequency</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phonologically</td>
<td>Phonologically</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transparent</td>
<td>Opaque</td>
</tr>
<tr>
<td><strong>L1 Spanish Low</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 24)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognates</td>
<td>83.7 (8.4)</td>
<td>82.8 (7.8)</td>
<td>82.3 (8.2)</td>
</tr>
<tr>
<td>Non-Cognates</td>
<td>81.2 (8.5)</td>
<td>82.5 (8.9)</td>
<td>83.2 (8.8)</td>
</tr>
<tr>
<td><strong>L1 Spanish High</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 26)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognates</td>
<td>86.5 (12.0)</td>
<td>84.8 (12.8)</td>
<td>84.0 (13.0)</td>
</tr>
<tr>
<td>Non-Cognates</td>
<td>81.5 (14.8)</td>
<td>83.5 (14.0)</td>
<td>84.2 (14.2)</td>
</tr>
<tr>
<td><strong>L2 English Low</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 13)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognates</td>
<td>47.3 (12.6)</td>
<td>46.8 (12.7)</td>
<td>42.5 (13.0)</td>
</tr>
<tr>
<td>Non-Cognates</td>
<td>34.8 (11.1)</td>
<td>35.4 (9.9)</td>
<td>39.9 (9.8)</td>
</tr>
<tr>
<td><strong>L2 English High</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognates</td>
<td>64.9 (13.9)</td>
<td>61.7 (16.0)</td>
<td>59.9 (13.9)</td>
</tr>
<tr>
<td>Non-Cognates</td>
<td>50.9 (15.5)</td>
<td>54.1 (13.3)</td>
<td>55.9 (15.9)</td>
</tr>
</tbody>
</table>

Looking at the results for the individual linguistic variables for the low and high groups, it is clear that these trends are similar to the ones for the whole group. In other words, there are minimal differences in the Spanish linguistic variables, while there appear to be greater differences in cognates/non-cognates for both groups in English as well as for high and low frequency items for both the low and high groups in English. A further analysis shows that in Spanish the variable of cognate was significant for both groups. For the low group, a paired samples t-test between cognates and non-cognates showed that cognate performance was significantly higher ($M = 83.7, SD = 8.4$), $t (23) = 2.315, p = .030$, than non-cognates ($M = 81.2, SD = 8.5$). For the high group a paired samples t-test was also significant, favoring cognates ($M = 86.5, SD = 12.0$) over non-cognates ($M = 81.5, SD = 14.8$), $t (25) = 5.122, p = .000$. There were no differences between high/low frequency and phonological transparency in Spanish for the low and high groups, just as there were no significant differences for the whole group for these two variables.
In English, the trend was also the same for the low and high groups as it was for the group as a whole. For the low group there were significant differences found in a paired samples t-test in L2 cognates ($M = 47.3, SD = 12.6$) and non-cognates ($M = 34.8, SD = 11.1$), $t (12) = 4.732, p = .000$. There were also significant differences for the low group between high and low frequency $t (12) = 5.810, p = .000$, with a higher mean score for high frequency ($M = 46.8, SD = 12.7$) over low frequency ($M = 35, SD = 9.9$). The same variables were significant for the high group as well: cognates ($M = 64.9, SD = 13.9$) over non-cognates ($M = 50.9, SD = 15.5$), $t (20) = 7.897, p = .000$. The high group also performed significantly better on high frequency items ($M = 61.7, SD = 16.0$) than low frequency items ($M = 54.1, SD = 13.3$), $t (20) = 4.068, p = .001$.

There were no significant differences for phonological transparency for either the low or high group in L2 English.

There were no significant differences for interaction effects of the linguistic variables between the low and high proficiency groups.

6.3. Results: Research Question Two – The Effect of Morphological Awareness on Reading Comprehension

In this section I will present the results of the statistical measures used to analyze the relationship between morphological awareness and reading comprehension in the L1 Spanish, and in the L2 English. I will also present the findings of the cross-linguistic effect of L1 morphological awareness on L2 reading comprehension and finally examine the differences between the low and high groups in each of these relationships. The overarching question in this segment of the study asks:

*To what degree does morphological awareness affect reading comprehension?*

To answer this question, I look at the effect of morphological awareness on reading comprehension in the L1 Spanish first, then in the L2 English and then the cross-linguistic relationship between Spanish morphological awareness and English reading comprehension.
a. What is the direct, indirect and total effect of morphological awareness in L1 Spanish on reading comprehension in the same L1 Spanish?

Seventy-eight participants completed all of the Spanish morphological awareness tasks, Spanish reading vocabulary and Spanish reading comprehension measures and were therefore included in the analysis of question 2 a). In order to answer the question, I first looked at the descriptive results including mean percent correct, mean grade level and standard deviations for the independent variable (L1 Spanish morphological awareness), the mediating variable (L1 Spanish reading vocabulary) and the dependent variable (L1 Spanish reading comprehension). The measure of morphological awareness in this analysis is a mean score of the four morphological awareness tasks: ALLD Word Study, The Morphological Relatedness Task, The Test of Morphological Structure and The Test of Syntactic Categories (Real and Nonce). Findings from the descriptive analyses are below in Table 6.7.

<table>
<thead>
<tr>
<th>L1 Spanish Assessments</th>
<th>Mean % Correct (SD)</th>
<th>Grade Level (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 Morphological Awareness</td>
<td>79.4 (10.6)</td>
<td>NA</td>
</tr>
<tr>
<td>\textit{ALLD} L1 Reading Vocabulary</td>
<td>62.6 (14.6)</td>
<td>7.7 (2.6)</td>
</tr>
<tr>
<td>\textit{ALLD} L1 Reading Comprehension</td>
<td>51.4 (16.3)</td>
<td>5.6 (2.6)</td>
</tr>
</tbody>
</table>

Participants performed better on the morphological awareness tasks in general than on the reading vocabulary assessment and had the lowest performance on reading comprehension. Since reading comprehension involves the most complex cognitive processes of the three tasks, this lower score was expected. Next, I looked at the correlations between these three variables in L1 Spanish. The correlation matrix is found in Table 6.8.
Table 6.8. Correlation Matrix for L1 Spanish Morphological Awareness and Reading Variables (N = 78)

<table>
<thead>
<tr>
<th></th>
<th>L1 Morphological Awareness</th>
<th>ALLD L1 Reading Vocabulary</th>
<th>ALLD L1 Reading Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 Morphological</td>
<td>1</td>
<td>.698**</td>
<td>.595**</td>
</tr>
<tr>
<td>Awareness</td>
<td></td>
<td>1</td>
<td>.463**</td>
</tr>
<tr>
<td>ALLD L1 Reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>.698**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ALLD L1 Reading</td>
<td>.595**</td>
<td>.463**</td>
<td>1</td>
</tr>
<tr>
<td>Comprehension</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Correlations are significant at the 0.01 level (2-tailed).

All of the reading variables were significantly correlated as expected because of the interrelatedness of reading processes. The strongest correlation was between morphological awareness in Spanish and Spanish reading vocabulary ($r = .698$, $p < .01$). Notably, Spanish morphological awareness had a stronger correlation with Spanish reading comprehension ($r = .595$, $p < .01$) than Spanish reading vocabulary had with Spanish reading comprehension ($r = .463$, $p < .01$).

In order to determine the effect of Spanish morphological awareness on reading comprehension in Spanish, reading comprehension was regressed on the composite morphological awareness score and reading vocabulary. There were two possible paths from L1 morphology to L1 reading comprehension: either (1) direct or (2) indirect through L1 vocabulary. Figure 6.3 below shows these two paths to L1 Reading comprehension, enumerated as (1) for direct and (2) for indirect. The theoretical model was proposed based on evidence in the literature that morphological awareness contributes first to reading vocabulary then to reading comprehension, especially for lower proficiency level readers. Therefore, reading vocabulary was regressed on morphological awareness to get the first part of the indirect path (2). Next, reading comprehension was regressed on morphological awareness for the direct path (1), then on reading vocabulary in order to determine the second part of the indirect path (2) through reading vocabulary to reading comprehension. The effect of reading vocabulary on reading comprehension reported in the path regression is beyond what morphological
awareness contributes alone in the model. Since there were no variables entered after reading vocabulary, there is no indirect effect possible for reading vocabulary. The total effect found in the regression table is equal to the sum of the direct effect of morphological awareness and the indirect effect through reading vocabulary.

**Figure 6.3. Theoretical Model of L1 Morphological Awareness to L1 Reading Comprehension, with Paths Enumerated**

![Diagram showing the theoretical model of L1 Morphological Awareness to L1 Reading Comprehension]

The direct, indirect and total effects of morphological awareness in L1 Spanish on L1 reading comprehension are reported in Table 6.9 below.

**Table 6.9. Standardized Direct, Indirect, and Total Effects of Reading Variables Within-Language on L1 Spanish Reading Comprehension (N = 78)**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DIRECT EFFECT</th>
<th>INDIRECT EFFECT</th>
<th>TOTAL EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 Morphological Awareness</td>
<td>.530**</td>
<td>.065</td>
<td>.595***</td>
</tr>
<tr>
<td>L1 Reading Vocabulary</td>
<td>.092</td>
<td>--</td>
<td>.092</td>
</tr>
</tbody>
</table>

***β coefficients are significant at the .001 level, ** significant at the .01 level.

There were strong, significant, direct (β = .530, p < .01) and total effects (β = .595, p < .001) of morphology on reading comprehension in Spanish. There was no unique contribution of Spanish vocabulary to Spanish reading comprehension in this model; however, Spanish vocabulary did add to the total effect of morphological awareness on reading comprehension, as shown by the small indirect effect (β = .065) that contributed to the total effect. The direct and

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36 Within the 78 participants analyzed in L1 Spanish, they ranged in L1 proficiency in the following ways: low-level n = 24 (2nd – 4th grade); mid-level, n = 28 (5th – 6th grade), and high-level n = 26 (7th – 11th grade).
indirect results of the regression are presented on the paths in Figure 6.4 below with
standardized beta coefficients for each path.

**Figure 6.4. Path Results for L1 Morphological Awareness to L1 Reading Comprehension**

There was a strong effect of L1 morphological awareness on L1 reading vocabulary ($\beta = .698$, $p < .001$), as expected; however the effect of L1 reading vocabulary on L1 reading comprehension was not significant ($\beta = .092$). In order to calculate the indirect path (2) from morphological awareness to reading comprehension through reading vocabulary, the standardized beta coefficients for each regression are multiplied, e.g. reading vocabulary on morphological awareness (.698) times reading comprehension on reading vocabulary (.092), which equals the indirect path (.065).

**b. What is the direct, indirect and total effect of morphological awareness in L2 English on reading comprehension in the same L2 English?**

Question 2 b) asks about the effect of English morphological awareness on English reading comprehension. As noted earlier, because of the limited ability in English of the participants at the time of the study, many were not able to complete the English test of morphological structure (TMS), which required the participants to fill in the blank in a sentence after manipulating a morphologically complex word. If I were to include the TMS in the analysis of question 2 b), I would have only had 53 total participants included in the English analysis. Because this number was too small to carry out the path regression, I decided to look at a
composite score of morphological awareness, which included the three other morphological awareness measures: ALLD Word Study, the Morphological Relatedness Task and the Test of Syntactic Categories (Real and Nonce). Furthermore, if only the 53 participants had been included, a large number of newcomers who were at the lower proficiency range in L1 Spanish reading would have been excluded since this is the group that had the most difficulty responding to the fill-in the blank questions. When I looked at the low and high groups, I could see that a higher proportion of low group participants were not able to complete the TMS: 35% of the total low group (n = 20) did not complete the TMS and 21% of the total high group (n = 24) did not complete the TMS.

There were 70 participants who were able to complete the three morphological awareness tasks in English, along with the English reading vocabulary and the English reading comprehension assessments. The procedure for analysis was the same as for question 2 a): I began by examining the descriptive statistics (mean percent correct, mean grade level and standard deviations) for the independent, mediating and dependent variables and then looked at the correlations between them. Descriptive results and correlations for the English morphological awareness and reading variables are presented in Tables 6.10 and 6.11, respectively.

**Table 6.10. Descriptive Results for L2 English Morphological Awareness and Reading Variables (N = 70)**

<table>
<thead>
<tr>
<th>L2 English Assessments</th>
<th>Mean % Correct (SD)</th>
<th>Grade Level (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 Morphological Awareness (-TMS)</td>
<td>53.0 (13.4)</td>
<td>NA</td>
</tr>
<tr>
<td><strong>ALLD L2 Reading Vocabulary</strong></td>
<td>36.2 (15.8)</td>
<td>3.8 (2.1)</td>
</tr>
<tr>
<td><strong>ALLD L2 Reading Comprehension</strong></td>
<td>34.4 (11.5)</td>
<td>2.8 (1.7)</td>
</tr>
</tbody>
</table>

In English, participants performed better on the morphological awareness measures than on the reading vocabulary and reading comprehension measures. This was the same pattern as was noted in Spanish as well. Unlike the L1 Spanish, however, there was not as great a
disparity between L2 Reading Vocabulary grade level \((M = 3.8, SD = 2.1)\) and L2 Reading comprehension grade level \((M = 2.8, SD = 1.7)\). Both L2 English reading vocabulary and L2 English reading comprehension mean scores were below fourth grade level for the entire group and only differed by one grade level. In the L1 Spanish, the mean grade level for reading vocabulary was two grade levels higher \((M = 7.7, SD = 2.6)\) than that of reading comprehension \((M = 5.6, SD = 2.6)\).

| Table 6.11. Correlation Matrix for L2 English Morphological Awareness and Reading Variables \((N = 70)\) |
|---------------------------------|-----------------|-----------------|
|                                | L2 Morphological Awareness (-TMS) | ALLD L2 Reading Vocabulary | ALLD L2 Reading Comprehension |
| L2 Morphological Awareness (-TMS) | 1                |                  |                  |
| ALLD L2 Reading Vocabulary      | .643**           | 1                |                  |
| ALLD L2 Reading Comprehension   | .529**           | .449**           | 1                |

** Correlation is significant at the 0.01 level (2-tailed).

All of the English morphological awareness and reading variables were correlated, with the strongest correlation between English morphological awareness and English reading vocabulary \((r = .643, p < .01)\). The same pattern of correlations between the variables was seen in the Spanish variables: morphological awareness and reading vocabulary were most strongly correlated, while reading vocabulary and reading comprehension had the most modest correlation \((r = .449, p < .01)\).

To answer the question 2 b) of the direct, indirect and total effect of L2 English morphological awareness on English reading comprehension, reading comprehension was regressed on reading vocabulary and on morphological awareness. The two paths, direct and indirect through reading vocabulary, from morphological awareness to reading comprehension are demonstrated in Figure 6.5 below. The figure is a segment taken from the entire cross-linguistic theoretical model of the relationship between morphological awareness and reading comprehension, presented in Chapter 3.
The findings on the effects of L2 morphological awareness to reading comprehension in L2 English are indicated in Table 6.12 below. The indirect effect indicates the effect of morphological awareness on reading comprehension through reading vocabulary in the L2 English; and the total effect is a sum of both the direct and indirect effects of morphological awareness on reading comprehension.

Table 6.12. Standardized Direct, Indirect, and Total Effects of Reading Variables Within-Language on L2 English Reading Comprehension (N = 70)³⁷

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DIRECT EFFECT</th>
<th>INDIRECT EFFECT</th>
<th>TOTAL EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 Morphological Awareness</td>
<td>.410**</td>
<td>.119</td>
<td>.529***</td>
</tr>
<tr>
<td>L2 Reading Vocabulary</td>
<td>.185</td>
<td>--</td>
<td>.185</td>
</tr>
</tbody>
</table>

³⁷β coefficients are significant at the .001 level, ** significant at the .01 level

For research question 2 b) there was a significant direct effect ($\beta = .410, p < .01$) and stronger total effect of L2 morphological awareness on reading comprehension ($\beta = .529, p < .001$) in L2 English. Like the within-language results for L1 Spanish, there was no significant contribution of English vocabulary to English reading comprehension on its own but it did contribute to the total effect of morphology plus vocabulary on reading comprehension. The

³⁷ Within the 70 participants analyzed in L2 English, they ranged in L1 proficiency in the following ways: low-level $n = 20$ (2nd – 4th grade), mid-level $n = 26$ (5th – 6th grade) and high-level $n = 24$ (7th – 11th grade).
direct and indirect results of the regression for L2 English are presented on the paths in Figure 6.6 below with standardized beta coefficients for each path.

Figure 6.6. Path Results for L2 Morphological Awareness to L2 Reading Comprehension

As seen in Figure 6.6. above, there was a strong effect of L2 morphological awareness on L2 reading vocabulary ($\beta = .641, p < .001$), similar to the results in L1 Spanish. The direct effect of L2 reading vocabulary on L2 reading comprehension was not significant ($\beta = .185$). The indirect path (2) from morphological awareness to reading comprehension through reading vocabulary was calculated by multiplying the standardized beta coefficients for each regression, i.e. reading vocabulary on morphological awareness (.641) times reading comprehension on reading vocabulary (.185), which equals the indirect path (.119).

c. What is the direct, indirect and total effect of morphological awareness in L1 Spanish on reading comprehension cross-linguistically in the L2 English?

Research question 2 c) 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 (1) and six indirect (2-7):
1. L1 morphology → L2 reading comprehension (DIRECT)
2. L1 morphology → L1 reading comprehension → L2 reading comprehension
3. L1 morphology → L1 vocabulary → L1 reading comprehension → L2 reading comprehension
4. L1 morphology → L1 vocabulary → L2 reading comprehension
5. L1 morphology → L1 vocabulary → L2 vocabulary → L2 reading comprehension
6. L1 morphology → L2 morphology → L2 reading comprehension
7. L1 morphology → L2 morphology → L2 vocabulary → L2 reading comprehension

These seven paths are illustrated in the theoretical model in Figure 6.7, with paths enumerated.

Figure 6.7. Cross-Linguistic Theoretical Model of L1 Morphological Awareness to L2 Reading Comprehension, with Paths Enumerated

In order to consider the cross-linguistic effect of L1 Spanish morphological awareness on L2 English reading comprehension, I looked at a subset of the population that had completed all of the morphological awareness and reading assessments in the two languages. Sixty participants were included in the cross-linguistic analysis based on their having finished all of the required tasks. The descriptive results of the dependent (morphological awareness) and independent (reading) variables for both L1 Spanish and L2 English are shown in Table 6.13.
Table 6.13. Descriptive Results for L1 Spanish and L2 English Morphological Awareness and Reading Variables (N = 60)

<table>
<thead>
<tr>
<th>Assessments</th>
<th>L1 Spanish Mean % Correct (SD)</th>
<th>L1 Spanish Grade Level (SD)</th>
<th>L2 English Mean % Correct (SD)</th>
<th>L2 English Grade Level (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphological</td>
<td>79.2 (10.6)</td>
<td>NA</td>
<td>53.1 (14.1)</td>
<td>NA</td>
</tr>
<tr>
<td>Awareness 38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALLD Reading</td>
<td>62.6 (15.1)</td>
<td>7.6 (2.7)</td>
<td>37.4 (16.6)</td>
<td>4.0 (2.2)</td>
</tr>
<tr>
<td>Vocabulary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALLD Reading</td>
<td>51.9 (17.0)</td>
<td>5.8 (2.7)</td>
<td>35.2 (12.0)</td>
<td>3.0 (1.8)</td>
</tr>
<tr>
<td>Comprehension</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As expected, Table 6.13 indicates that the mean scores for L1 Spanish were higher than the mean scores for L2 English on all morphological awareness and reading measures. For example, the mean grade level for Spanish reading comprehension was 5.8 (SD = 2.7) and the mean grade level in English was almost three grades below that of their L1 Spanish at grade three (SD = 1.8). Their mean vocabulary grade level (M = 7.6, SD = 2.7) in Spanish was also more than three grades above their mean grade level in English (M = 4.0, SD = 2.2); and the morphological awareness mean % correct in the L1 Spanish (M = 79.2, SD = 10.6) was also higher than that of L2 English (M = 53.1, SD = 14.1).

Table 6.14 provides the results for the correlations between the L1 and L2 morphological awareness and reading measures.

---

38 In English, the composite morphological awareness score did not include the Test of Morphological Structure (TMS).
Table 6.14. Correlation Matrix for L1 Spanish and L2 English Morphological Awareness and Reading Variables (N = 60)

<table>
<thead>
<tr>
<th></th>
<th>1. L1 Morph</th>
<th>2. ALLD L1 Reading Vocab</th>
<th>3. ALLD L1 Reading Comp</th>
<th>4. L2 Morph (-TMS)</th>
<th>5. ALLD L2 Reading Vocab</th>
<th>6. ALLD L2 Reading Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. L1 Morph</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. ALLD L1</td>
<td>.700**</td>
<td>.475**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Vocab</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. ALLD L1</td>
<td>.627**</td>
<td>.475**</td>
<td>.535**</td>
<td>.650**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Comp</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. L2 Morph</td>
<td>.611**</td>
<td>.602**</td>
<td>.535**</td>
<td>.531**</td>
<td>.423**</td>
<td></td>
</tr>
<tr>
<td>5. ALLD L2</td>
<td>.389**</td>
<td>.447**</td>
<td>.349**</td>
<td>.531**</td>
<td>.423**</td>
<td></td>
</tr>
<tr>
<td>Reading Vocab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. ALLD L2</td>
<td>.421**</td>
<td>.302*</td>
<td>.457**</td>
<td>.531**</td>
<td>.423**</td>
<td></td>
</tr>
<tr>
<td>Reading Comp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

All of the variables are significantly correlated, which is to be expected because of the interrelatedness of the components of reading, described in detail in Chapter 2. Table 6.14 indicates that the strongest correlations are between L1 Spanish morphological awareness and L1 Spanish reading vocabulary (r = .700, p < .01) and between L2 English morphological awareness and L2 English reading vocabulary (r = .650, p < .01).

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 6.15 and standardized regression coefficients are diagrammed in Figure 6.8 below.
Table 6.15. Standardized Direct, Indirect, and Total Effects of Cross-Language Reading Variables on L2 English Reading Comprehension (N = 60)\(^{39}\)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DIRECT EFFECT</th>
<th>INDIRECT EFFECT</th>
<th>TOTAL EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 Morphological Awareness</td>
<td>.139</td>
<td>.282</td>
<td>.421***</td>
</tr>
<tr>
<td>L1 Reading Vocabulary</td>
<td>-.166</td>
<td>.180</td>
<td>.014</td>
</tr>
<tr>
<td>L1 Reading Comprehension</td>
<td>.218</td>
<td>.100</td>
<td>.318*</td>
</tr>
<tr>
<td>L2 Morphological Awareness</td>
<td>.331~</td>
<td>.094</td>
<td>.425**</td>
</tr>
<tr>
<td>L2 Reading Vocabulary</td>
<td>.152</td>
<td>--</td>
<td>.152</td>
</tr>
</tbody>
</table>

***\(\beta\) coefficients are significant at the .001 level, ** significant at the .01 level, * significant at the .05 level and ~ approaching significance at the .1 level.

Table 6.15 indicates that 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 English reading comprehension. The path model for the whole group suggests that there are some strong cross-linguistic predictors of L2 English reading comprehension, namely L1 Spanish morphology (\(\beta = .421, p < .001\)) and L1 Spanish reading comprehension (\(\beta = .318, p < .05\)). Although L1 morphology has only a small and insignificant direct effect on L2 reading comprehension, the total effect is strong as other variables in the indirect path (i.e. L1 reading vocabulary and L1 reading comprehension) facilitate the relationship. As expected, L1 reading comprehension makes a significant contribution in total effect on L2 reading comprehension, although it too shows no significant direct effect in this analysis. L2 morphology also has a strong total effect on L2 reading comprehension (\(\beta = .425, p < .01\)); this is not surprising given the strong correlation between L1 and L2 morphology (\(r = .611, p < .01\)). Moreover, in Figure 6.8 below, the indirect paths are more visibly identified. That is, the two strongest indirect paths emerge from 1) L1 Spanish morphology to L2 English reading comprehension through facilitation of L1 Spanish reading comprehension (\(\beta = .126\)) and 2) L1 Spanish morphology to L2 English reading comprehension facilitated through L2 English morphology (\(\beta = .079\)).

\(^{39}\) Of the 60 participants, they ranged in L1 proficiency in the following ways: \(n = 18\) low-level (2\(^{nd}\) – 4\(^{th}\) grade), \(n = 20\) mid-level (5\(^{th}\) – 6\(^{th}\) grade) and \(n = 22\) high-level (7\(^{th}\) – 11\(^{th}\) grade).
In this cross-linguistic solved path model, it is also clear that morphology in both L1 and L2 does have a strong effect on reading vocabulary (.700 and .619, respectively). Therefore, it is apparent that the total effect of L1 morphological awareness on L2 reading comprehension is a complex with interaction between numerous variables.

I turn now to the last research question in this category:

d. *To what extent is the effect of morphological awareness on reading comprehension different for low versus high L1 proficiency readers?*

The final part of the second main research question examines the difference between a low group (second – fourth grade) of L1 Spanish readers and a high group (seventh – eleventh grade) of L1 readers on the multiple regression paths from L1 morphology to L2 reading comprehension. The groups were identified using their L1 Spanish reading proficiency grade level as determined by their performance on the ALLD reading comprehension section in L1 Spanish. Descriptive results including means and standard deviations are presented in Table 6.16 below for the low and high groups on L1 Spanish and L2 English morphological awareness and reading measures.
Table 6.16. Descriptive Results for Low and High Group L1 and L2 Morphological Awareness and Reading Variables

<table>
<thead>
<tr>
<th>L1 Spanish</th>
<th>Low Group, 2nd – 4th Grade (n=24)</th>
<th>High Group, 7th – 11th Grade (n=26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessments</td>
<td>Mean % Correct (SD)</td>
<td>Grade Level (SD)</td>
</tr>
<tr>
<td>L1 Morphological Awareness</td>
<td>72.3 (10.2)</td>
<td>NA</td>
</tr>
<tr>
<td>ALLD L1 Reading Vocabulary</td>
<td>55.3 (13.5)</td>
<td>6.4 (2.4)</td>
</tr>
<tr>
<td>ALLD L1 Reading Comprehension</td>
<td>36.5 (11.6)</td>
<td>2.8 (9.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L2 English</th>
<th>Low Group, 2nd – 4th Grade (n=20)</th>
<th>High Group, 7th – 11th Grade (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessments</td>
<td>Mean % Correct (SD)</td>
<td>Grade Level (SD)</td>
</tr>
<tr>
<td>L2 Morphological Awareness</td>
<td>43.6 (6.7)</td>
<td>NA</td>
</tr>
<tr>
<td>ALLD L2 Reading Vocabulary</td>
<td>27.1 (10.2)</td>
<td>3.3 (7.9)</td>
</tr>
<tr>
<td>ALLD L2 Reading Comprehension</td>
<td>43.6 (6.1)</td>
<td>2.2 (6.7)</td>
</tr>
</tbody>
</table>

Table 6.16 above shows that the low group and the high group had similar trends to the group as a whole. That is, they performed better morphological awareness measures than vocabulary and vocabulary scores were higher than reading comprehension in both L1 Spanish and L2 English. A closer look at the difference between vocabulary and reading comprehension scores, however, suggests that there is a greater disparity between vocabulary proficiency and reading comprehension for the low group, than for the high group in both L1 and L2. For example, the low group is performing at about mid-sixth grade in L1 reading vocabulary, but just below third grade level in reading comprehension; whereas the high group is performing at a mean grade level of ninth grade in reading vocabulary and just over mid-eighth grade in L1 reading comprehension. Similar patterns are seen with L2 English, for example the low group mean grade level for reading vocabulary is just over third grade level, and their mean reading comprehension grade level is one grade level below that at just over second grade. For the high group, their mean grade level for reading vocabulary, fourth grade, and mean grade level for reading comprehension are almost identical, just under fourth grade level ($M = 3.9$).
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. Table 6.17 below indicates the results for the path regression analyses on reading comprehension in L1 Spanish and L2 English for the low and high groups.

Table 6.17. Standardized Direct, Indirect, and Total Effects of Within-Language Reading Variables Reading Comprehension for the Low and High Groups

<table>
<thead>
<tr>
<th>L1 Spanish</th>
<th>Low Group, 2nd – 4th Grade (n=24)</th>
<th>High Group, 7th – 11th Grade (n=26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARIABLE</td>
<td>DIRECT EFFECT</td>
<td>INDIRECT EFFECT</td>
</tr>
<tr>
<td>L1 Morphological Awareness</td>
<td>.489*</td>
<td>-.023</td>
</tr>
<tr>
<td>L1 Reading Vocabulary</td>
<td>-.037</td>
<td>--</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L2 English</th>
<th>Low Group, 2nd – 4th Grade (n=20)</th>
<th>High Group, 7th – 11th Grade (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARIABLE</td>
<td>DIRECT EFFECT</td>
<td>INDIRECT EFFECT</td>
</tr>
<tr>
<td>L2 Morphological Awareness</td>
<td>.468~</td>
<td>-.133</td>
</tr>
<tr>
<td>L2 Reading Vocabulary</td>
<td>-.338</td>
<td>--</td>
</tr>
</tbody>
</table>

***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.

The results in the L1 Spanish for the low proficiency group (n = 24), showed that the total effect β = .466, p < .05 and direct effect of morphology β = .489, p < .05 were both significant contributors to L1 Spanish reading comprehension. In fact, since vocabulary had a negative correlation with reading comprehension in Spanish for this group, the direct effect of morphology was stronger than the total effect, which included reading vocabulary in the model. Neither morphology nor vocabulary made any significant contributions to reading comprehension in Spanish for the high group (n = 26).

Within the L2 English only: for the low group (n = 20), the direct effect of morphology approaches significance β = .468, p < .1. For the high group (n = 24), both the direct effect β = .499, p < .05 and total effect β = .645, p < .001 of L2 morphology were significant contributors...
to L2 English reading comprehension. It is interesting to note that for this high group, English reading vocabulary added extensively to the model of predicting English reading comprehension, suggesting that morphological skills plus vocabulary are crucial to English reading comprehension.

In summary of the within-language results, Spanish morphology only made a significant contribution to reading comprehension for those reading at or below fourth grade level. In English, morphology was only a significant predictor of reading comprehension for the high group, those reading at or above seventh grade level in L1 Spanish. The results for Spanish and English are mutually supportive because the mean grade level for the low group in L1 Spanish reading comprehension was just under third grade or 2.8, while the mean grade level for the high group in L2 English was 3.9, or just under fourth grade level. In other words, morphological awareness plus vocabulary had a strong total effect on reading comprehension in both L1 Spanish and L2 English only for those readers that were at about a third to fourth grade proficiency. While morphological awareness in L2 English approached significance in predicting English reading comprehension for the low group, results suggest that their reading proficiency in English, just over second grade, was too low to make any strong predictions.

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 second and fourth grade level in L1, with a mean grade level of 2.8 (SD = .94). The high group participants were reading between seventh and eleventh grade level in L1 with a mean grade level of 8.7 (SD = 1.55). A t-test showed that there was a significant difference in L1 reading comprehension between the low (M = 36, SD = 13, N = 18) and high groups (M = 69, SD = 9, N = 22); t(38)=1.112, p = .000. There was also a significant difference in the scores for L1 Spanish morphology low group (M = 72, SD=10) and high group (M = 86, SD = 8); t(38)=3.502, 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, and did not approach significance. This reiterates the fact that due to the low proficiency in English, there are no significant predictors in either L1 Spanish or L2 English for English reading comprehension. Table 6.18 below shows the direct, indirect and total effects of L1 and L2 morphological awareness on L2 English reading comprehension for the high L1 reading proficiency group only.

Table 6.18. 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)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DIRECT EFFECT</th>
<th>INDIRECT EFFECT</th>
<th>TOTAL EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 MorphologicalAwareness</td>
<td>.591~</td>
<td>-.151</td>
<td>.440*</td>
</tr>
<tr>
<td>L2 MorphologicalAwareness</td>
<td>.216</td>
<td>.383</td>
<td>.599*</td>
</tr>
</tbody>
</table>

***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.

Note that in this model considering only the high group, L1 reading comprehension was not significant due to the fact that it was used as the determination variable for the proficiency group, low or high. Therefore, due to homogeneity within the group of L1 reading comprehension score, it does not contribute to the regression model. For the high group, both L1 morphological awareness and L2 morphological awareness had significant total effects on L2 English reading comprehension. There was no significant contribution of L1 reading vocabulary, L1 reading comprehension or L2 vocabulary to L2 reading comprehension for this high group.

40 There was a mid-group as well, that was excluded as too similar to the low and high groups.
7. Discussion

The study presented in the previous chapters adds new information to the literature on morphological awareness and its relationship to reading comprehension. Specifically, the current study addresses the morphological awareness of newcomer secondary school emergent bilinguals in New York City. There is a critical need for this population across the U.S. to develop both vocabulary and reading comprehension strategies, yet evidence-based research on how to develop these strategies for older students has been lacking. The current study emphasizes the essential role of morphological awareness and the students’ prior abilities, namely the language and literacy skills that they can transfer from their L1 Spanish, to the development of English reading vocabulary and reading comprehension. The extensive range in L1 Spanish reading ability of the population in this study from almost pre-literate to above grade level is representative of many emergent bilingual classrooms across the U.S.; therefore the research-based data presented here is valuable for educators and researchers alike in identifying variables that contribute to L2 English reading development.

As outlined in Chapter 4, the study presented here has two major research questions: one is to investigate the role of linguistic variables that are embedded into morphological awareness tasks and linguistic contexts for morphological tasks; the second is an examination of how morphological awareness contributes to reading comprehension, either directly or through an indirect path which takes into account the mediating variable of reading vocabulary. Both of these questions are investigated in a study carried out on adolescent Spanish-English emergent bilinguals in ninth and tenth grades who had arrived in the U.S. with a range of reading proficiency skills in their L1 Spanish from low-literacy (e.g. second to fourth grade) to higher-literacy (e.g. seventh to eleventh grade). I first looked at each of the research questions with regard to the entire group of eighty-eight emergent bilinguals, and then I further analyzed them by looking at the two distinct groups of lower and higher readers mentioned above. In the following sections of this chapter I will reflect on the results illustrated in Chapter 6 and provide
interpretations of the findings with reference to both my hypotheses in Chapter 4 and the literature that was reviewed in Chapter 2. The first section will address the role of linguistic variables in morphological awareness and the second section will address the effect of morphological awareness on reading comprehension in the L1 Spanish, L2 English and cross-linguistically from Spanish to English.

7.1. The Role of Linguistic Variables in Morphological Awareness

In this section, I will discuss the findings from Chapter 6 on the role of linguistic variables in morphological awareness, namely cognates, frequency of derived words, and phonological transparency. These linguistic variables might act as mediators in the relationship between morphological awareness and other reading skills such as reading vocabulary and reading comprehension. After discussing the role of the three linguistic variables mentioned above, I will address the role of semantic contexts and syntactic contexts on morphological awareness.

Cognates: The role of cognates is an important avenue to explore for cross-linguistic research, especially in languages that have many similarities such as Spanish and English that share roots and affixes from ancestor languages of Greek and Latin. In many recent studies related to morphological awareness and reading skills (e.g. Nagy et al., 1993; Ramírez et al., 2013) 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. Research suggests that many young readers do not have an awareness of these cognates; however, older, more proficient readers do appear to make use cognate relationships (Hancin-Bhatt & Nagy, 1994; Nagy et al., 1993).

The current research compares performance on morphological tasks while controlling for the number of cognates that exist in each of the measures. On three of the researcher-created morphological awareness measures, the Morphological Relatedness Task (MRT), the Test of
Morphological Structure (TMS), and the Test of Syntactic Categories with real words (SynCat-Real), there were a total of 51 items that were cognates and 51 non-cognates. Examples of cognates in the present study are the English word *decision* and Spanish *decisión*; examples of non-cognates are the English *marriage* and Spanish *casamiento*.

Based on the previous literature on cognate awareness with older students (Hancin-Bhatt & Nagy, 1994) I had hypothesized that the higher level readers (those reading between seventh and eleventh grade in L1 Spanish) would be able to make use of cognates in English, while the lower level readers (those reading between second and fourth grade in L1 Spanish) would not be able to recognize Spanish roots and affixes when reading in English. If lower-level readers are not able to recognize cognates in the English morphologically derived words, then it could be considered a stage of development in morphological awareness. Findings from the present study showed that when analyzed as a whole group, participants performed significantly better on the English items that contained cognates from Spanish than those with non-cognates. A closer analysis also showed that both low and high proficiency readers performed significantly better on cognates than non-cognates throughout the L2 English morphological awareness measures. This finding is contrary to that of previous studies in that lower proficiency Spanish-speaking readers struggled to identify cognates in English texts (Hancin-Bhatt & Nagy, 1994). The result from the current study that low-level readers are able to recognize cognates might suggest that cognate recognition is more closely tied with age of the reader rather than reading proficiency level since both the low and high readers performed higher on cognates than non-cognates in this study. An unexpected result from the data was that not only did participants perform better on Spanish cognates found in the L2 English tasks, but they also performed significantly better on English cognates than non-cognates in the L1 Spanish tasks. This finding means that the cognate recognition was bidirectional from Spanish to English and English to Spanish. The majority of participants had been in the U.S. no longer than two months (roughly 60%) at the time of the study; however the remainder of them had been in the country for
almost two years. During the time in the U.S., they had been exposed to oral and written academic English, which could be impacting their reading of words in Spanish as well as English41.

**Frequency:** In addition to the ability to recognize cognates, the frequency of the derived word has also been a significant variable in morphological awareness. Research has shown that more productive morphemes are learned at an early stage of reading than those that are infrequent and less productive (Anglin, 1993). Highly productive, frequent morphemes such as the agentive –*er* in *teacher* are learned as early as age four in typically developing English speakers. According to Anglin (1993), less productive morphemes such as the adjectival suffix –*ous* in the example below are acquired much later in the elementary years, e.g. *continue* (verb) + ous = *continuous* (adjective). In the current study, I measured frequency by assigning either high or low frequency to the morphologically derived word as a whole (including base word and affix).

I had hypothesized that the lower level readers would experience difficulty with low frequency items in both languages, and especially in English. In analyzing the results for Spanish, I found that there were no frequency effects in the morphological awareness tasks in L1 Spanish. The explanation for this might be due to the fact that morphological awareness in L1 was at a high enough level that frequency did not have any significance on ability; this was true for both the low and high proficiency groups where the mean score on all morphological awareness tasks was over 70%. Contrary to Spanish, there were significant frequency effects for both the low and high groups in English, meaning that both groups performed better on morphological awareness items that were high frequency than low frequency, as hypothesized. This result suggests that there is a developmental trend in reading ability and recognition of low frequency derivations. Frequency is also tied to breadth of vocabulary knowledge; therefore

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41 Future studies might consider length of exposure to English in the U.S. to find differences in cognate performance between newer arrivals and those that had been in the country longer.
students are more likely to know words of low frequency in their L1 because of the increased years of exposure to the language.

**Phonological transparency:** Previous studies have shown that there can be an effect from phonological transparency in the morphological structure on morphological awareness (Fowler & Liberman, 1995; Leong, 1989; 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). The following example shows how the shift in phonological representation might impede some readers’ ability to recognize a morphological relationship between the two words *sign* and *signature*. For example in *sign* (silent “g” – noun) + *(a)ture = signature* ([g] is produced – noun), there is a consonant shift when the derivational suffix is added to the base word *sign*. In the current study, derived words were either marked as phonologically transparent or phonologically opaque. The transparent condition was where there was no phonological change, with or without an orthographic change from the base word to the derived word, e.g. *fame* (noun) + *ous = famous* (adjective – dropped the letter ‘e’). The phonologically opaque condition was where there was either a phonological change in vowel or consonant, with or without an orthographic shift, as seen in the example above from *sign* → *signature*.

The hypothesis in the current research stated was that if it is shown that morphological relationships are recognized regardless of phonological shift, then this will suggest knowledge of morphological structure independent of phonological awareness, and in turn may independently influence reading abilities. I will address this question of independence in Spanish, first and then in English.

In the current study, there were no differences between phonologically transparent or opaque items in Spanish for either the low or high group. Again, this might be because the participants were performing at a high threshold in morphological awareness tasks in Spanish, so that phonological opacity did not impede their ability to recognize word relationships, or it might be due to a difference in Spanish and English readers in their L1, where low-proficiency
readers do not have difficulty with phonological shift conditions. The second position could be attributed to the highly transparent orthographic system of Spanish, so that readers apply reading strategies to the individual words (monomorphemic or morphologically complex) and are not concerned with the phonological and/or orthographic shifts from one related word to another. The results presented here suggest that in Spanish, phonological transparency does in fact operate as a skill independent from morphological awareness. However, because it is unclear whether the independence is due to the fact that all Spanish-speaking participants performed too high on the morphological awareness tasks or because of the phonological opacity of orthographic representation in Spanish, more research is needed in this language to confirm the independence of morphological awareness as a skill. There were also no interaction effects in Spanish between the variables of cognate, frequency and phonological transparency. The reason for this is most likely due to the fact that the differences in each of these binary variables were minimally significant (for cognates) or not at all (frequency and phonological transparency).

In English, in the first analysis of looking at the individual effects of phonological transparency, i.e. comparing the 51 items that were phonologically transparent to those 51 that were phonologically opaque, there were no differences in performance by either the low or high proficiency group. This finding is in line with some researchers such as Mahony, et al. (2000) who found that phonological transparency was not a significant factor in morphological awareness, and that there were more effects related to frequency than phonological transparency. In fact, when I looked closer at the interaction effects between the three variables of cognates, frequency and phonological transparency I did find that there were two interaction effects of the variables together. The first effect was another confirmation that frequency is more significant than phonological transparency. For example, when the English morphologically complex words were all cognates, there was a significant difference between the ones that were both high frequency and phonologically opaque (e.g. possible-possibility) and
those that were low frequency and phonologically transparent (e.g. *pure-purist*). In other words, high frequency was a better predictor of success on these types of items rather than phonological transparency.

The second interaction effect with phonological transparency was seen when the items were all non-cognates and high frequency and differed only between phonologically transparent (e.g. *care-careful*) and opaque derivations (e.g. *long-length*). Participants performed significantly higher on the items that were phonologically transparent than those that were phonologically opaque. This second interaction effect suggests that phonological transparency may become significant only when one of the other linguistic variables, in this case the variable of cognate, is also a hindrance in recognizing word parts. For the most part, the results from the current research do suggest that morphological awareness does act independently from phonological awareness, except for in those extreme cases where other variables are also interacting with phonological opacity.

The last facet of this research question was to see whether semantic environments or syntactic environments had an effect on morphological awareness. In order to answer the second part of this research question I looked at the sub-tests within the morphological awareness tasks. The two tests that tapped into semantic properties were the *ALLD* Word Study and the *Morphological Relatedness Test* (MRT). In the Word Study assessment, students were asked to examine individual morphemes (such as *sub* in *submarine*). Results showed that participants performed significantly better on the tasks within the morpho-semantic environments than those that were within morpho-syntactic environments in both L1 Spanish and L2 English. This finding is in line with previous research (Tyler & Nagy, 1989) that suggested morphological awareness in relational knowledge develops before morpho-syntactic knowledge. Because the relational knowledge develops early on in reading stages, it is not as strong a predictor for reading comprehension as the morpho-syntactic tasks that concentrate
more on manipulating word structure in the context of a sentence where syntactic cues are present.

7.2. The Effect of Morphological Awareness on Reading Comprehension

The second main research question in this study motivated an investigation of the effect of morphological awareness on reading comprehension in Spanish, in English and then again across languages from Spanish to English. I chose to present the results in a path analysis so that I could note how the independent variables (i.e. morphological awareness and reading vocabulary) worked together to contribute to reading comprehension. The reason for looking at morphological awareness alone as a direct effect and together with reading vocabulary as an indirect effect on morphological awareness is that previous research has suggested that morphological awareness may contribute to reading comprehension indirectly through reading vocabulary for lower proficiency readers, and then more directly as reading proficiency is strengthened (see for example Kieffer & Lesaux, 2008 for L2 English; and Nagy et al., 2006 for native English speakers).

The first component of this question was to examine the within-language effect of morphological awareness on reading comprehension in L1 Spanish. I hypothesized that due to the similarity between English and Spanish, morphological awareness would have a direct and indirect effect (through reading vocabulary) on reading comprehension in Spanish. The results showed that morphological awareness did in fact contribute significantly both directly and indirectly to reading comprehension in L1 Spanish. This 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 (2009) finding that morphology made a significant contribution to reading comprehension in the L1 Spanish. While Ramírez was able to show this relationship for fourth and seventh graders, the present research showed that it was also evident in adolescent readers
at a range of proficiency levels (i.e. from second to eleventh grade in L1 Spanish). One unexpected result was that the measure used in this study indicated that Spanish reading vocabulary only made a small contribution to the indirect effect of morphological awareness on the path to reading comprehension and no unique contribution directly to reading comprehension in Spanish. One explanation for this might be 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. Another, more likely reason for this is the shared variance between the vocabulary and morphological awareness tasks. Because morphological awareness and reading vocabulary were very highly correlated in L1 Spanish, they together had the strongest effect on reading comprehension. It is important to note that in this model, morphological awareness was stronger than reading vocabulary in L1 Spanish. When entering the variables into the regression model, I entered morphological awareness first, and vocabulary did not make any significant contribution above and beyond that of morphological awareness. To test the path of the theoretical model, I tried adding morphological awareness after reading vocabulary in a stepwise regression and found that morphological awareness did contribute to reading comprehension above and beyond that of reading vocabulary. This finding promotes confidence in the strength of contribution of morphological awareness to reading comprehension above and beyond reading vocabulary.

When looking at the low and high proficiency readers as separate groups, the effect of morphological awareness on reading comprehension was only significant for the low group (second – fourth grade level). In this participant subset of learners, 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 in Spanish. This finding is in contrast to that of the earlier studies on L1 readers in at least in English and Arabic (e.g. Abu-Rabia, 2007; Carlisle, 2000; Mahony et al., 2000; Nagy et al., 2003; Nagy et al., 2006; Wysocki & Jenkins, 1987). Based on findings in previous research I had hypothesized that morphological awareness would not have an effect on reading comprehension for the low proficiency reading group. Previous research in both L1 and L2 English has suggested that once morphological skills advance, somewhere between fourth and sixth grade, the relationship between morphological awareness and reading comprehension grows stronger. The current study has shown that the relationship is stronger for L1 Spanish 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 fourth grade (see Carlisle, 2000; Katz, 2004; Nagy et al., 2006). One explanation for the contribution of morphology to reading comprehension at the earlier stage in Spanish rather than English, in the current study, could be 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 lower proficiency readers may be attuned to morphological distinctions (whether inflectional or derivational) earlier than L1 English readers. The L1 English readers are just beginning to develop this skill at third grade when they need to pay attention to such complex morphological changes in words they encounter in texts at and above third grade level. A similar explanation was proposed by Ramírez et al. (2010) 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 et al., 2010). It could be that the relationship between
morphological awareness and reading comprehension in Spanish grows weaker at a certain point (e.g. between fourth – sixth grade) while other sub-skills 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 the second part of the research question, regarding predictors of L2 English, I hypothesized that there would be both a direct and total effect of morphological awareness on reading comprehension in the L2 English. The results confirmed my hypothesis for this group of emergent bilingual newcomers. 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 English 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. I would posit that the low group’s ability in English was just too low to make significant use of L2 morphological awareness skills to contribute at all to the English reading. The high group was still reading at a level low enough in English (i.e. below fourth grade) that they were relying on word study skills such as morphological generalization and recognition of cognates. Recall that the results in the L1 Spanish established that when looking specifically at lower and higher proficiency readers, morphological awareness only contributed significantly to reading comprehension for the low group, i.e. L1 readers with a mean grade level of just under third grade. In L2 English, the results parallel those of the L1 Spanish. In both languages morphological awareness has a significant effect on reading comprehension for readers at about a third to fourth grade proficiency level in that language.
The hypothesis for the last component of the question about cross-linguistic predictors 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. Morphological awareness did intersect with and make use of many of the mediating variables on the path to L2 reading comprehension, which made the total effect even stronger. What was not expected was that L1 morphological awareness would have such a powerful total effect on L2 reading comprehension that it would be stronger than the total effect 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; Garrison-Fletcher, 2012; van Gelderen et al., 2007). In fact, the only other variable that had as strong a total effect on L2 reading comprehension was L2 morphology. Though it was unexpected that the cross-linguistic results would turn out so strongly in favor 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 sub-skills associated with reading.

Finally, I looked at the cross-linguistic relationship seen between L1 morphology and L2 reading comprehension in the low and high proficiency groups. Only for the high group of readers, did L1 morphological awareness make any significant contribution to reading comprehension in English. 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, who were reading at a mean grade level below fourth grade in English, relies 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.

### 7.3. New Cross-Linguistic Model of L1 Morphological Awareness to L2 Reading Comprehension

In Chapter 3, I presented a theoretical cross-linguistic model of the relationship between morphological awareness and reading comprehension and with the data I collected on Spanish-English emergent bilinguals, I tested this theoretical model. From the path regression results analyzed I present a New Model, depicted in Figure 7.1 below.

**Figure 7.1. New Model of L1 Morphological Awareness to L2 Reading Comprehension**

![New Model of L1 Morphological Awareness to L2 Reading Comprehension](image)

The New Model presented here shows the strong relationship between morphological awareness and reading vocabulary in both L1 and L2, and the total effect that they together contribute to reading comprehension in each language. The model also highlights the strong connection between L1 and L2 reading comprehension, which has been evidenced in previous research and again verified in this model (e.g. Garrison-Fletcher, 2012). The strong prediction of L1 morphology for L2 morphology is also represented in this model, as my research suggests, the more developed L1 morphological awareness skills are the more L2 skills will also be developed; this in turn contributes to other components of reading such as reading vocabulary and reading comprehension in the L2. The insignificant paths in the Theoretical Model, i.e.
direct relationships between L1 morphological awareness and L2 reading comprehension, L1 reading vocabulary and L2 reading comprehension, and finally between L1 and L2 reading vocabulary were removed from the New Model.

7.4. Limitations of this Study

As with most research studies, there were some limitations with the current study. For example, future studies should consider better control measures. In the present research one of the control measures had to be discounted for poor implementation; the working memory measure involving reverse number recall was administered in a noisy setting where it was impossible for participants to avoid distraction. In the past it had been used as a reliable measure of cognitive ability through working memory (Garrison-Fletcher et al., 2008). Another oral vocabulary measure should be considered for controlling non-academic vocabulary knowledge. Due to the fact that the one used in this study contained items that were both ‘everyday’ and academic, it was difficult to distinguish a genuine oral vocabulary deficit from lack of academic terminology in the L1 Spanish.

In general the testing procedures were limited in this study because our research team was only allowed access to the participating high school on three days for administration of a battery of assessments. Due to this narrow window of time, there were many students that did not complete all of the assessments, which brought down the overall number of participants tested from 105 to 88 included in the study, and only 60 that had completed enough of the assessments to be part of a cross-linguistic analysis.

Another caveat to this study is that the linguistic variables were originally created in English so that there were an equal number of high and low frequency items, phonologically transparent/opaque items and cognates/non-cognates. Once the English versions of the morphological awareness assessments were complete, I transadapted them into Spanish, and in this process some of the linguistic variables were lost. There were the same number of
cognates/non-cognates in both languages; however, the other two variables of high/low frequency and phonological transparency/opacity were unequal in the Spanish tests. In future studies, both languages should have equal control over the linguistic variables used.
8. Conclusions

There have been more than two decades of research focused on the effect of morphological awareness on reading skills, in particular on phonological awareness, word reading, vocabulary, and reading comprehension. Until recently, the majority of research had concentrated on monolingual English-speaking children (e.g. Carlisle, 2003; Katz, 2004; Nagy et al., 2003), a few studies looked at the morphological abilities of secondary school adolescents and adult English speakers (Nagy et al., 2006; Tighe & Binder, 2013) and a growing number of studies have been concerned with emergent bilinguals in the U.S. (e.g. Goodwin et al., 2012; Kieffer & Lesaux, 2008; Kieffer & Lesaux, 2012). Few prior studies have looked at cross-linguistic relationships with morphological awareness and reading skills (Hancin-Bhatt & Nagy, 1994; McBride-Chang et al., 2007; Nagy et al., 1993; Saiegh-Haddad & Geva, 2008; Schiff & Calif, 2007; Wang et al., 2006; Zhang & Koda, 2011); only one group of researchers have examined the contribution of Spanish morphological awareness to English word reading (Ramírez et al., 2010) and English reading comprehension (Ramírez et al., 2013). The present research fills a critical gap in the research on the role of morphological awareness in reading comprehension for secondary school emergent bilinguals, by taking into consideration both the L2 English and the skills that can be transferred from the L1 Spanish. This present research has confirmed that morphological awareness does play a significant role in reading comprehension for this population of adolescent newcomers. In particular morphological awareness in the L1 contributes to both L1 reading comprehension and L2 morphological awareness (as shown in the New Model introduced Chapter 7), which both help to facilitate the effect of L1 morphological awareness on L2 reading comprehension.

The L1 Spanish findings for morphological awareness have also confirmed that there is a developmental trend in morphological skills in Spanish that are tied to L1 reading proficiency level and not just age or grade level of the reader. These findings are evidenced in the fact that,
when tested on L1 Spanish reading proficiency, mid proficiency L1 readers (fifth to sixth grade level) significantly outperformed low L1 proficiency readers (second to fourth grade level), and high L1 proficiency readers (seventh to eleventh grade level) also significantly outperformed the mid-level readers. A new finding in this study was that morphological awareness contributed significantly and directly to reading comprehension in the L1 Spanish for readers that were on average at a third grade reading proficiency level. In the majority of L1 studies, which were predominantly in English, morphological awareness seemed to increase sharply between fourth and sixth grade level and did not contribute directly to reading comprehension for readers that were below a fourth or fifth grade proficiency level (Abu-Rabia, 2007; Carlisle, 2000; Kieffer & Lesaux, 2008; Mahony et al., 2000; Nagy et al., 2003; Nagy et al., 2006; Wysocki & Jenkins, 1987). The finding that morphological awareness was well developed for readers at third grade proficiency level in l1 Spanish could be due to language-specific differences in Spanish or due to the fact that the participants in the current study were at a higher biological age than those in other studies. This is an avenue for future research, discussed in more detail in the last section of this chapter.

Finally, I further investigated the nature of morphological awareness and conclude that certain linguistic variables, such as frequency of the morphologically derived word and the interaction of phonological transparency with low frequency and non-cognate words, can hinder morphological awareness in emergent bilingual readers in the L2. In many cases the inability to recognize low frequency and phonological opacity in morphologically derived words can be overcome if/when there is an ability to identify the word as a cognate from the L1. These findings provide educators with implications for classroom reading instruction and practice with secondary school emergent bilinguals.

**Implications for Reading Instruction and Practice:** It is important to reiterate that reading is a complex cognitive skill, involving many facets of language and content knowledge to which morphological awareness and vocabulary knowledge are not the only path to successful
reading for emergent bilinguals. However, this research does provide some insights for curriculum and methods of instruction in the high school classroom for emergent bilinguals. Because there was such a high correlation found between morphological awareness and reading vocabulary, educators should consider strategies in vocabulary teaching and reading comprehension that engage the students’ morphological abilities, i.e. the ability to recognize and manipulate word parts found in complex morphologically derived words. There are a handful of ongoing and emerging research projects that have already been advocating for such instruction in vocabulary (see Graves et al., 2013). It is beyond the scope of this dissertation to critique and evaluate the ongoing pedagogical programs in vocabulary teaching; however, it is important to note that educators have already begun incorporating morphological strategies into their vocabulary programs across the country. For example, Vocabulary Instruction and Assessment for Spanish Speakers (VIAS) is an ongoing research project based at the Center for Applied Linguistics (August et al., 2010) and another intervention project from the University of California, Santa Cruz called Vocabulary Innovations in Education (VINE) addresses the vocabulary needs of both monolingual English speakers and non-native English speakers through vocabulary strategies such as cognate awareness and analysis of word parts (Flinspach et al., 2009). More in depth translanguaging strategies that incorporate all of a bilingual’s language abilities into learning (Celic & Seltzer, 2011) have been initiated in emergent bilingual and bilingual classrooms nationwide as well. The cross-sectional data presented in the current study provides the critical research-based evidence needed to continue to fuel these types of intervention practices in emergent bilingual classrooms.

Directions for Future Research: There are several areas in which this research could be developed in the future. First, although emergent bilinguals with a home language of Spanish make up the majority (63.4%) of the total emergent bilingual population in New York City, there are a number of other language groups that have a significant presence in the city as well (OELL, 2013). Future studies in morphological awareness and its relationship to reading should include
these other language groups such as: Chinese, Bengali, Arabic, Haitian Creole and Russian. Including such languages would provide a much richer understanding of the relationship between the L1 and English reading comprehension. For instance, Chinese has a morphological structure that is much different from that of English and Spanish; morphemes are all free and concatenated in the same way as compound words are formed in English (wind + shield $\rightarrow$ windshield). The question is whether such differences would materially affect the now established relationship between morphological awareness and reading comprehension in learners of English whose L1 is Spanish L1. Another reason for inclusion of multiple languages is that stages of derivational morphological awareness might develop differently in speakers of languages that are highly inflected. One suggestion for Spanish-speakers’ awareness of morphological structures at an earlier reading proficiency was because they might already be attuned to word structure analysis because of the many inflections they pay attention to at an early stage in language development (Ramírez et al., 2010). Including languages that have differing levels of inflectional morphology in morphological awareness studies would help to sort out this issue.

Since the research in the present study investigated participants of the same age who performed at different levels of L1 reading, it would also be worthwhile to compare how readers of the same proficiencies but at different ages would perform. For example, the low reading group in this study is comprised of all adolescents reading between second and fourth grade level in Spanish. If these participants were paired with perhaps a third grade emergent bilingual cohort who were reading about on grade level in L1 Spanish (i.e. between second to fourth grade), it could be determined 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, there is no difference between biological age and reading proficiency groups. On the other hand, world
knowledge that has been accrued by the older readers might affect their knowledge of and ability to reflect on morphologically related words.

There are three other variables that were discussed in the morphological awareness literature but were not included in the development of the morphological awareness tasks for the present study. These variables might be considered as a secondary analysis in future studies. One variable is semantic transparency, comparing words that have more obvious related meanings for example, beauty and beautiful, with words that have undergone a certain amount of semantic drift from their ancestral closer relationship in meaning, for example flight and flighty (see Derwing, 1976). Another variable is related to frequency and word formation processes, i.e. productivity of the morpheme and boundedness. More specifically, future research could consider items that are bound stem + bound affix (quant – quantity) to free stem + bound affix (formal – formality) and to free stem + free stem (life + jacket – lifejacket).

Considering the frequency of the affix alone or the combination of high frequency roots and low frequency affixes or vice versa is something I would recommend for future research. There are also many similarities in the morphological suffixes between languages (see Hancin-Bhatt & Nagy, 1994). For example, the same derivational suffix –ity is –idad in Spanish or complex → complexity and complejo → complejidad. A linguistic variable that could be considered in a study of the effects of cognates is the relationship between those words that are both derived in the L1 and L2, and those words where a word is derived in one language and monomorphemic in the other. For example in Spanish and English the word for ‘singer’ is not a cognate, but both languages use a morphologically derived word: cant + -ante = cantante and sing + -er = singer. In other cases where the words are not cognates, one language prefers a derived word and the other a monomorphemic word, such as the word for ‘teacher,’ which in Spanish is maestro (not derived, monomorphemic) and in English teach + -er → teacher (morphologically complex, derived).
The final suggestion for future research would be to test the New Model of the cross-linguistic relationship between morphological awareness and reading comprehension with participants from different age groups, proficiencies and language backgrounds. Results from testing this model will help us better understand the complexities of L1 reading skills and how they interact to contribute to vocabulary development and reading in the L2 English, as noted previously this is an important topic for emergent bilingual research.

In conclusion, the research presented in this study has provided compelling evidence that morphological awareness does play a significant role in reading comprehension in both the L1 Spanish and L2 English for this population of adolescent emergent bilinguals. Additionally, the research has shown that the emergent bilinguals in this study, most of whom had only been in the U.S. at the time of the study for two months, were able to utilize skills from their L1 Spanish while completing reading assessments in English. Even the lowest proficiency readers performed better on English items that contained cognates from their L1 Spanish, which is evidence that they are able to transfer this word-analysis skill while reading words in English. Research also suggests that the higher-level Spanish readers, all of whom had been in the U.S. for less than two years at the time of the study, were using morphological awareness skills from L1 Spanish to contribute to L2 morphological awareness and in turn L2 reading comprehension skills. This higher-level group, impressively, was immediately able to apply these L1 reading skills to their emergent language, English, and results showed that they were reading on average at a fourth grade proficiency level in English. As stated previously and confirmed with this study, adolescent emergent bilinguals bring many skills with them from their L1 Spanish including morphological awareness, which significantly impact their development of English language and reading comprehension. These L1 skills are valuable tools for their progress and success in U.S. academic environments.
Appendices

Appendix A: Researcher-Created L1 Spanish Measures of Morphological Awareness
- Prueba de Relaciones de Palabras – Morphological Relatedness Task (MRT)
- Prueba de Estructura de Palabras – Test of Morphological Structure (TMS)
- Prueba de Categorías Sintácticas – Test of Syntactic Categories (SynCat-Real and SynCat-Nonce)

Appendix B: Researcher-Created L2 English Measures of Morphological Awareness
- Morphological Relatedness Task (MRT)
- Test of Morphological Structure (TMS)
- Test of Syntactic Categories (SynCat-Real and SynCat-Nonce)
Appendix A: Researcher-Created L1 Spanish Measures of Morphological Awareness

(MRT) Prueba de Relaciones de Palabras:

Instrucciones: Lean los siguientes pares de palabras en silencio mientras yo los leo en voz alta. Traten de decidir si la segunda palabra viene de la primera palabra y tiene un significado similar. Marquen SÍ si piensan que la segunda palabra significa lo mismo, o casi lo mismo, que la primera palabra. Marquen NO si piensan que la segunda palabra no tiene un significado similar a la primera palabra.

Ejemplo A: feliz felicidad SÍ NO
Ejemplo B: mal maleta SÍ NO
Ejemplo C: trabajo trabajador SÍ NO

1) barrer barrio SÍ NO 24) concordar concordancia SÍ NO
2) departamento departamental SÍ NO 25) letra letargo SÍ NO
3) dura durazno SÍ NO 26) lento lenteja SÍ NO
4) abra abrazo SÍ NO 27) persona personal SÍ NO
5) posible posibilidad SÍ NO 28) conocer conocimiento SÍ NO
6) sincero sinceridad SÍ NO 29) cocinar cocinero SÍ NO
7) importar impresión SÍ NO 30) tambor también SÍ NO
8) decidir decisión SÍ NO 31) presentar presentable SÍ NO
9) barbero barbaridad SÍ NO 32) coche cochina SÍ NO
10) ocho octavo SÍ NO 33) mejilla mejillón SÍ NO
11) ver verso SÍ NO 34) tierno tierra SÍ NO
12) ser serpiente SÍ NO 35) aburrir abuso SÍ NO
13) res respirar SÍ NO 36) exprimir expresión SÍ NO
14) curioso curiosidad SÍ NO 37) espejo espera SÍ NO
15) especial especialista SÍ NO 38) meter metedura SÍ NO
16) comuna comunista SÍ NO 39) fama famoso SÍ NO
17) tal talento SÍ NO 40) profesión profesional SÍ NO
18) final finalista SÍ NO 41) educar educación SÍ NO
19) sol soldado SÍ NO 42) mojado mojar SÍ NO
20) ventana vender SÍ NO 43) así asistir SÍ NO
21) éxito exitoso SÍ NO 44) sanar sanidad SÍ NO
22) amplio amplitud SÍ NO 45) cantar cantante SÍ NO
23) supervisar supervisión SÍ NO 46) región regional SÍ NO
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(TMS) Prueba de Estructura de Palabras:

**Instrucciones:** Les voy a decir una palabra y voy a leer una oración. Quiero que cambien la palabra para que complete bien la oración. Lean la oración en silencio mientras yo la leo en voz alta. Llenen el espacio en blanco con la forma de la palabra que mejor complete la oración.

Ejemplo A: **Ayudar.** Mi hermana me ofreció su ayuda______________.
Ejemplo B: **Agrícola.** Mi tío es un ____________________.
Ejemplo C: **Secadora.** La ropa necesita más tiempo para ____________________.

1) **Originalidad.** Ese cuadro es el ________________.
2) **Maravilla.** La vista desde la montaña fue ________________.
3) **Cinco.** Este estudiante es el cuarto y el próximo es el ________________.
4) **Permitir.** Su papá se rehusó a darle ________________.
5) **Aventurero.** El viaje de esquiar parecía una ________________.
6) **Popularidad.** La chica quiere ser ________________.
7) **Decisión.** Para el niño fue difícil ________________.
8) **Logro.** Las buenas notas son difíciles de ________________.
9) **Humano.** El buen hombre fue conocido por su ________________.
10) **Discusión.** Los enemigos tienen mucho que ________________.
11) **Mejoramiento.** Después de la clase, mi ortografía va a ________________.
12) **Alegre.** La niña saltó ________________.
13) **Éxito.** La mujer tenía una profesión muy ________________.
14) **Expresar.** En inglés, 'OK' es una ________________.
15) **Fuerza.** La chica era muy ________________.
16) **Peligroso.** Los niños no están en ________________.
17) **Bailar.** El señor era un muy buen ________________.
18) **Aparecer.** Ella se preocupa por su ________________.
19) **Famoso.** El actor logró mucha ________________.
20) **Conocer.** El profesor tenía mucho ________________.
21) **Casamiento.** Ella es la mujer con quien él quiere ________________.
22) **Amoroso.** Era un hombre lleno de ________________.
23) **Hornear.** El panadero pone el pan en el ________________.
24) **Razón.** Su argumento fue ________________.
(SynCat-Real) Prueba de Categorías Sintácticas:

Instrucciones: Les voy a leer una oración y cuatro formas posibles de una palabra para completar la oración. Lean las oraciones en silencio mientras yo las leo en voz alta. Van a elegir la forma de la palabra que mejor complete la oración. Después, marquen la letra de la palabra que han elegido.

Ejemplo A: Las ________ que nos dio fueron mal.
   a) directo  b) direcciones c) dirigir    d) directamente
Ejemplo B: Los niños y niñas son tratados con ________.
   a) igualar     b) igualmente    c) igualdad    d) igual
Ejemplo C: Vimos la ________ puesta del sol en la playa.
   a) hermosa     b) hermosura    c) hermosear    d) hermosamente

1) Su ______________ cambia con la edad.
   a) personificar b) personal    c) personalidad    d) personalizar
2) Vender limonada en el verano es ________________.
   a) lucro        b) lucrare    c) lucrativo    d) lucroso
3) Ella lo miró ________________ a la espera de la respuesta.
   a) fijación        b) fijativo    c) fijar    d) fijamente
4) Él quiere dar una buena ________________ esta noche.
   a) impresión        b) impresionable    c) impresionante    d) impresionar
5) Su gato es muy ________________ por la mañana.
   a) actividad        b) activación    c) activar    d) activo
6) Es la hora de ________________ al bebé.
   a) bañador        b) baño    c) bañista    d) bañar
7) La desembocadura del río es muy ________________.
   a) ampliación        b) amplitud    c) amplia    d) ampliar
8) Mucha gente gana dinero en la ________________ petrolera.
   a) industria        b) industrialización    c) industrializar    d) industrioso
9) La ________________ del lago es al menos 10 metros.
   a) profundo        b) profundizar    c) profundidad    d) profundamente
10) Los niños son demasiado jóvenes para _______________.
   a) conductivo  b) conductor  c) conducción  d) conducir

11) Esta noche es la última _______________ del espectáculo.
   a) actuar  b) actual  c) actor  d) actuación

12) Esta chaqueta es muy _______________.
   a) calor  b) calurosa  c) calurosamente  d) caliente

13) El precio de la _______________ sigue subiendo.
   a) eléctrico  b) electrizar  c) eléctricamente  d) electricidad

14) A ella le gusta mantener una vida _______________.
   a) sanar  b) sanamente  c) sanidad  d) sana

15) Es difícil _______________ un perro del otro.
   a) identidad  b) idénticos  c) identificación  d) identificar

16) Las olas del mar aumentan de la _______________ en mal tiempo.
   a) fuerte  b) fortalecer  c) fuerza  d) fuertemente

17) Ella tiene su propio _______________ para organizar el armario.
   a) sistemática  b) sistema  c) sistematicidad  d) sistemáticamente

18) Él es un _______________ muy bueno.
   a) cantante  b) cantar  c) canción  d) canto

19) Después del accidente el paciente necesitaba de cuidados _______________.
   a) intensivos  b) intensidades  c) intensificar  d) intensificación

20) Las plantas necesitan sol y agua para _______________.
   a) crecimiento  b) crecer  c) crecido  d) creciente

21) Mi asistente va a _______________ el nuevo procedimiento.
   a) demostrar  b) demostración  c) demostrativo  d) demostrable

22) El gobierno trata de _______________ los impuestos.
   a) regularmente  b) regularidad  c) regulación  d) regular

23) Los agricultores _______________ sus suelos en la primavera.
   a) fertilizante  b) fertilidad  c) fertilización  d) fertilizan

24) Un aumento en la tasa de natalidad hace crecer la _______________.
   a) popular  b) popularidad  c) popularizar  d) población
(SynCat-Nonce)
**Instrucciones:** Les voy a leer una oración y cuatro formas posibles de una palabra para completar la oración. La diferencia con la actividad anterior es que en ésta, las palabras para completar la oración no son reales. Elijan cuidadosamente la que crean que mejor complete la oración. Después, marquen la letra de la palabra que han elegido.

Ejemplo: Debes ______________ los dos lados.

   a) pulantemente  b) pulador  c) pular  d) pulativo

1) El éxito de todo el ______________ dependió totalmente de David.
   a) cadocitivo  b) cadocional  c) cadolizar  d) cadoción

2) Cada ser vivo tiene su propia ______________.
   a) peticura  b) peticuramiento  c) peticuración  d) peticural

3) Ella sabe mucho sobre el medio ambiente, es una ______________.
   a) durición  b) duricar  c) durioso  d) durista

4) Mi papá es muy ______________.
   a) rinar  b) rinoso  c) rinado  d) rinosamente

5) La reunión estuvo muy ______________.
   a) ludifimado  b) ludifimar  c) ludítimes  d) ludífiva

6) La Internet nos permite obtener una cantidad enorme de ______________.
   a) ribunar  b) ribunación  c) ribunante  d) ribunador

7) A María le gusta ______________ por teléfono.
   a) senfular  b) senfulación  c) senfulando  d) senfulante

8) Para que te entienda tienes que hablar ______________.
   a) felulación  b) felulador  c) felulamente  d) felulal

9) Los perros pertenecen al reino animal y los árboles al reino ______________.
   a) filitación  b) filital  c) filitativo  d) filitativamente

10) El paraíso es un lugar ______________.
    a) desarudamente  b) desarudar  c) desarudo  d) desarudiendo
## Appendix B: Researcher-Created L2 English Measures of Morphological Awareness

### (MRT) Morphological Relatedness Test:

**Directions:** Read the following word pairs silently as I read them aloud. Try to decide if the second word comes from the first word and has a similar meaning. Circle YES if you think the second word means the same thing or almost the same thing as the first word. Circle NO if you think the second word does not have a similar meaning to the first word.

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49) law lawyer YES NO 84) let letter YES NO
50) mess message YES NO 85) vary various YES NO
51) commune communist YES NO 86) perform performance YES NO
52) moth mother YES NO 87) peace peaceful YES NO
53) sad saddle YES NO 88) fame famous YES NO
54) art artist YES NO 89) apple application YES NO
55) sing singer YES NO 90) department departmental YES NO
56) educate education YES NO 91) doll dollar YES NO
57) pea peel YES NO 92) success successful YES NO
58) add additive YES NO 93) curry curable YES NO
59) flat flatten YES NO 94) ban banana YES NO
60) associate association YES NO 95) pity pitiful YES NO
61) electric electricity YES NO 96) corn corner YES NO
62) ant anterior YES NO 97) cat cattle YES NO
63) sum summer YES NO 98) marry marriage YES NO
64) teach teacher YES NO 99) bear beard YES NO
65) final finalist YES NO 100) develop development YES NO
66) bit bitter YES NO
67) bet better YES NO
68) comb combination YES NO
69) parent parental YES NO
70) space spacious YES NO
71) deep depth YES NO
72) sincere sincerity YES NO
73) major magic YES NO
74) know knowledge YES NO
75) decide decision YES NO
76) power powerful YES NO
77) beauty beautiful YES NO
78) funny function YES NO
79) damp dampen YES NO
80) insult insulation YES NO
81) man manners YES NO
82) numb numbers YES NO
83) car carry YES NO
**TMS Test of Morphological Structure:**

*Directions:* I am going to say a word and read you a sentence. I want you to change the word so that it best matches the sentence. Read the sentence silently as I read it aloud. Fill in the blank with the form of the word that best matches the sentence.

Example A: *Help.* My sister is very *helpful*.

Example B: *Farm.* My uncle is a ____________________.

Example C: *Dryer.* The clothes need more time to ____________________.

1) *Decision.* It was hard for the boy to ____________________.
2) *Success.* The woman’s career was very ____________________.
3) *Courageous.* The man showed great ____________________.
4) *Five.* This student is the fourth and the next is the ____________________.
5) *Marvel.* The view from the mountain was ____________________.
6) *Achievement.* Good grades are difficult to ____________________.
7) *Reason.* Her argument was ____________________.
8) *Originality.* This painting is the ____________________.
9) *Strength.* The girl was very ____________________.
10) *Adventure.* The ski trip seemed ____________________.
11) *Famous.* The actor gained a lot of ____________________.
12) *Marriage.* She is the woman he wants to ____________________.
13) *Know.* The professor had a lot of ____________________.
14) *Teach.* The man was a very good ____________________.
15) *Human.* The kind man was known for his ____________________.
16) *Baker.* She put the bread in the oven to ____________________.
17) *Happy.* The little girl jumped up and down ____________________.
18) *Popularity.* The girl wants to be ____________________.
19) *Express.* ‘OK’ is a common ____________________.
20) *Discussion.* The enemies have a lot to ____________________.
21) *Improvement.* My teacher wants my spelling to ____________________.
22) * Permit.* Her father refused to give ____________________.
23) *Appear.* He cared about his ____________________.
24) *Dangerous.* The children are not in any ____________________.
**(SynCat-Real) Syntactic Categories Test:**

*Directions:* I am going to read you a sentence and four possible forms of a word to complete the sentence. Read the sentences silently while I read them aloud. Choose the form of the word that best completes the sentence. Then, circle the letter of the word you have chosen.

Example A: The ________ he gave us took us to the wrong street.
   a) directs  b) directions  c) directing  d) directed

Example B: Boys and girls are treated with ________.
   a) equalize  b) equally  c) equality  d) equal

Example C: We watched the ________ sunset from the beach.
   a) beautiful  b) beauty  c) beautify  d) beautifully

1) His _______________ changed as he got older.
   a) personify  b) personal  c) personality  d) personalize

2) It can be _______________ to sell lemonade in the summer.
   a) profit  b) profitably  c) profitable  d) profitability

3) She stared at him _______________ while waiting for the answer.
   a) steady  b) steadfast  c) steadiness  d) steadily

4) He wants to make a good _______________ tonight.
   a) impression  b) impressionable  c) impressively  d) impressive

5) Her cat is very _______________ in the morning.
   a) activity  b) activation  c) activate  d) active

6) It is time to _______________ the baby.
   a) bath  b) bathless  c) bather  d) bathe

7) The mouth of the river is very _______________.
   a) widely  b) width  c) wide  d) widen

8) Many people make money in the oil _______________.
   a) industry  b) industrialization  c) industrialize  d) industrious

9) The _______________ of the lake is at least 10 feet.
   a) deep  b) deepen  c) depth  d) deeply

10) Children are too young to _______________ cars.
    a) driven  b) driver  c) driveable  d) drive

11) Tonight is the last _______________ of the show.
    a) perform  b) performable  c) performer  d) performance
12) The jacket provided a lot of _______________.
   a) warm    b) warmth    c) warmly    d) warmness
13) The cost of _______________ keeps going up.
   a) electric    b) electrify    c) electrical    d) electricity
14) She likes to maintain a _______________ lifestyle.
   a) heal    b) health    c) healthily    d) healthy
15) It is difficult to _______________ one dog from the other.
   a) identity    b) identical    c) identification    d) identify
16) We measured the _______________ of the room.
   a) long    b) lengthen    c) length    d) lengthy
17) She has her own _______________ to organize the closet.
   a) systematic    b) system    c) systematicity    d) systematically
18) He is a very good _______________.
   a) swimmer    b) swim    c) swimmable    d) swimmingly
19) After the accident the patient needed _______________ care.
   a) intensive    b) intensity    c) intensify    d) intensification
20) Plants need sunshine and water to _______________.
   a) growth    b) grow    c) growable    d) grower
21) My assistant will _______________ the new procedure.
   a) demonstrate    b) demonstration    c) demonstrative    d) demonstrable
22) The government attempts to _______________ taxes.
   a) regular    b) regularity    c) regulation    d) regulate
23) The farmers _______________ their fields in the spring.
   a) fertilizer    b) fertility    c) fertilization    d) fertilize
24) Increased birth rates cause the _______________ to grow.
   a) popular    b) popularity    c) popularize    d) population
Directions: I am going to read you a sentence and four possible forms of a word to complete the sentence. The difference with this activity and the previous one is that in this one the words to complete the sentence are not real. Carefully choose the word that you believe best completes the sentence. Then, circle the letter of the word you have chosen.

Example: You have to _______________ both sides.
   a) curfament    b) curfamator    c) curfamate    d) curfamative

1) The success of the whole _______________ depends entirely on David.
   a) dispribatively    b) dispribational    c) dispribatify    d) dispribation

2) Every living thing has its own _______________.
   a) torbature    b) torbativize    c) torbatable    d) torbatify

3) She knows a lot about the environment, she is a _______________.
   a) vergalize    b) vergalicious    c) vergalify    d) vergalist

4) My dad is very _______________.
   a) tribacize    b) tribacious    c) tribacion    d) tribacism

5) The meeting was very _______________.
   a) spectitiously    b) spectitionalize    c) spectition    d) spectitive

6) The Internet allows us to get a huge amount of _______________.
   a) superfilize    b) superfilation    c) superfilial    d) superfilable

7) Maria likes to _______________ on the telephone.
   a) fidamorate    b) fidamorian    c) fidamorational    d) fidamorally

8) In order for her to understand you, you need to talk _______________.
   a) progenious    b) progenify    c) progenally    d) progener

9) Dogs belong to the animal kingdom and trees to the _______________ kingdom.
   a) birendist    b) birendal    c) birendalize    d) birendify

10) Paradise is a _______________ place.
    a) malburnity    b) malburnify    c) malburnicious    d) malburnally
References


