

THE ACQUISITION OF L2 READING COMPREHENSION:
THE RELATIVE CONTRIBUTION OF LINGUISTIC KNOWLEDGE
AND EXISTING READING ABILITY

by

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Abstract

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The study presented here examines the development of second language (L2) reading comprehension among adolescents who speak Spanish as their native language (L1) and are just beginning to learn English. The existing research on L2 reading comprehension among adolescents has focused on the transfer of reading skills from the L1 to the L2 and on the role of L2 linguistic knowledge. The research has suggested that reading skills transfer from the L1 to the L2, but that L2 linguistic knowledge plays the strongest role in L2 reading comprehension. However, previous research has not fully investigated the role of the L1 in the L2 reading development of adolescent learners. Crucially, students with low levels of L1 reading have not been included in the research, and such students must be studied in order to get a complete picture of the role of L1 reading in L2 reading.

This study further expands on the previous research by including a group of participants not included in the research program on L2 reading comprehension among adolescent learners—namely, adolescent newcomer English language learners (ELLs) who arrive in the United States and enter the school system in middle or high school. Research on these students is lacking and little is known about their development of L2 academic skills.

The main finding from the study is that L1 reading comprehension is the strongest contributor to L2 reading comprehension, as compared to the other predictor variables: L2 vocabulary, L2 syntax, and L1 vocabulary. This result is in opposition to previous research findings that L2 language skills play a more important role in L2 reading comprehension than L1 reading comprehension. It is clear that for newcomer adolescent ELLs in U.S. schools, their level of L1 reading is an important contributor to their development of L2 reading comprehension. Thus, educators should be aware of their students' L1 reading skills upon entry to school in order to provide them with the best instruction.

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1. Introduction

The goal of the study reported here is to further our understanding of the acquisition of second language (L2) reading comprehension among adolescents. The study will fill important gaps in the research on L2 reading by including adolescents with a range of existing literacy skills in their native language (L1), focusing on the domain in reading that is critical for older learners—reading comprehension, and looking at the role of both L1 and L2 linguistic skills in L2 reading comprehension.

The study looks at the development of English reading comprehension among adolescents who speak Spanish as their native language, enrolled in the ninth and tenth grades in New York City public high schools. The students are in the beginning stages of English development, having been in the United States for less than two years at the time of the study. Adolescent English language learners (ELLs) are the focus of the study because there is a lack of research on this population of students who are struggling in U.S. schools. The research on L2 reading development among adolescents has been conducted largely in foreign language learning situations and little has been done on second language learners in the United States. In a paper summarizing the avenues for future research in second language literacy acquisition, Snow notes that “a much greater focus on postprimary English-language learners is needed.” She goes on to say that “practitioners are desperate for information about how best to serve older immigrant students” (Snow, 2006, p. 642). This information is so important because these students need more and better services to help them succeed. Adolescent ELLs have less time to develop L2 academic skills than young children, as they enter the school system in the later grades and must learn English while also learning the academic content needed to

graduate from high school. And the graduation rates for ELLs in U.S. schools are very low; about 23% of ELLs age 16-24 are either not enrolled in school or do not have a high school diploma or the equivalent (Morse, 2005). Research into how adolescent ELLs develop the critical academic skills required for high school graduation is important in order to better inform instruction and lead to higher levels of academic achievement for these students.

Reading comprehension is a critical academic skill and one with which L2 learners have considerable difficulty. Studies which focus on a comparison of L2 learners and their monolingual peers show that both groups behave similarly in word-level skills (e.g. word reading and spelling), but the difference in performance is seen in higher-level skills such as reading comprehension (Lesaux, Koda, Siegel, & Shanahan, 2006).

“Existing large-scale data sets on the school achievement of language-minority students in the United States and abroad suggest that comprehension is a significant area of difficulty for these learners.” (Lesaux et al., 2006, p. 100). In the 2006 report of the National Literacy Panel, August and Shanahan note that language-minority students rarely approach the same levels of comprehension proficiency as their monolingual peers. Furthermore, on the 2005 National Assessment for Educational Progress, 96% of ELLs enrolled in the eighth grade scored below the basic level on the reading portion (Short & Fitzsimmons, 2007). These students are struggling to acquire high levels of L2 academic literacy in U.S. schools, and research is needed in order to provide information on their development of L2 reading.

The primary research question in the present study is whether the acquisition of L2 reading comprehension is influenced more by a learner’s existing reading ability or

language ability. This question is modeled after Alderson's (1984) seminal question: "Is reading in a foreign language a reading problem or a language problem?" This question has shaped the research program in second language reading acquisition among adolescents. The question is not simply whether reading in a second language requires both reading skills and language skills, but involves the question of what skills are the most important in second language reading. It is uncontroversial that L2 reading involves some reading-specific skills and some language-specific skills.¹ For example, in order to read in a second language, you must know the vocabulary and the syntax of that language (language-specific, or linguistic, skills). You must also know how to decode words, which is a reading-specific skill, in that it involves knowledge of the relationship between the writing system and the spoken language and is a skill that is used only in reading.

What is debatable is whether reading in a second language involves more reading-specific or more language-specific skills. Specifically, I ask whether existing reading skills or linguistic skills, in the L1 or the L2, play a stronger role in the development of L2 reading comprehension among adolescents who have just begun learning to read in their L2. Here another important question arises: do reading-specific skills transfer from a student's first language to their second language? Cummins (1991) argued that L1 reading skills transfer to L2 reading and this has been further supported by many other studies (see, for example, Lee & Schallert, 1997; Verhoeven, 1990). Although we know that L1 reading skills and L2 language knowledge are both important in L2 reading, looking at their relative importance can help shed light on the nature of L2 reading comprehension. If L1 literacy skills are the most important factors in L2 reading, then we

¹The research program in monolingual reading has also supported the notion of reading comprehension being composed of both language-specific and reading-specific skills.

have evidence that L1 reading-specific skills transfer to the L2 and that L2 reading comprehension is impacted more by reading-specific skills than L2 linguistic knowledge. And if L2 linguistic knowledge is the most important skill in L2 reading, then focusing on building language proficiency should result in better L2 reading.

The question of the relative importance of language skills versus reading skills in the development of L2 reading comprehension has important implications for the education of adolescent ELLs. For instance, if it is true that L2 linguistic skills are the most important factor in the development of L2 reading comprehension, then the instruction of adolescent ELLs should focus on, for example, the development of L2 academic vocabulary. However, if existing reading skills are the most important factor in the development of L2 reading comprehension, then instruction may focus on the further development of reading-specific skills, in addition to the language skills normally taught to second language learners. Additionally, assessing incoming ELLs for level of L1 literacy could help to inform the instruction and placement of these students. A first step in answering these questions is to determine which factors have the strongest relationship with L2 reading comprehension. However, in order to fully address the instructional implications, an intervention study is needed.

The research to date has given conflicting answers to the above questions. I will review the research on second language reading comprehension and report on the results from a pilot study in addition to the full study, with the aim of clarifying the comparative roles of L1 literacy and L2 linguistic knowledge in L2 literacy.

In my review of the literature I will discuss the acquisition of L2 reading comprehension among younger learners (children in primary school) and older learners

(secondary school students and beyond). I will report on the results of the two groups separately as the research findings differ between the populations. Among bilingual children, some evidence suggests that L1 literacy plays the most important role in L2 literacy acquisition. Children who are first instructed in their dominant L1 become more successful readers than children who are instructed only in their L2 (see Akinnaso, 1993 for a review of some of these studies). Thus, it seems as if L1 literacy is the most important predictor of L2 literacy among this group. However, most of the research on L2 reading among children has not directly looked at the relative importance of L1 reading and L2 proficiency in L2 reading.

Researchers on bilingualism, notably Cummins, have argued that a good L1 language base aids in the acquisition of a second language (Cummins 1979, 1981). This theory has been minimally tested in the literature on L2 reading, mostly among children, with evidence that L1 linguistic skills contribute significantly to the acquisition of L2 literacy skills (see, for example, Carlisle, Beeman, Davis, & Spharim, 1999; Durgunoglu, Nagy, & Hancin-Bhatt, 1993; and Gabriele, Troseth, Martohardjono, & Otheguy, 2009). However, research into the components of L2 reading comprehension among adolescents has not taken L1 language skills into account, only looking at reading in the L1 and language skills in the L2.

Much of the research on L2 reading among adolescents has focused on the transfer of L1 reading skills to the L2. Cummins (1981) argued that L1 reading skills transfer to L2 reading and this has been further supported in the literature (see, for example, Lee & Schallert, 1997; Royer & Carlo, 1991; Verhoeven, 1990). Many of the studies looking at the transfer of L1 reading skills also asked Alderson's question, leading

researchers to look at the relative importance of L1 reading skills and L2 linguistic knowledge on L2 reading comprehension. And among this research on L2 reading among adolescents, the consensus has been that L2 linguistic skills play the most important role in L2 reading comprehension, with L2 vocabulary knowledge generally thought to be the most important factor. Thus, although the literature has suggested that both L1 reading and L2 linguistic knowledge are important in L2 reading, L2 linguistic knowledge has been thought to be the strongest predictor of L2 reading among adolescent second language learners.

However, in these studies on L2 reading, only participants with age-appropriate levels of L1 literacy have been included. In order to understand the role of the L1 in the acquisition of L2 reading comprehension, studies must include students with both low and high levels of L1 reading ability. But participants with very low levels of L1 reading ability have not been investigated, and their inclusion in a study on the components of L2 reading comprehension is critical in order to address the question of the relative importance of L1 reading versus L2 language skills in the acquisition of L2 reading comprehension. Furthermore, the existing research on L2 reading comprehension among adolescents has largely been done with students learning a foreign language, often at the college level. Research on L2 reading has not focused on second language learning situations in which the students speak a minority language as their L1 and are learning the dominant societal language as their L2. In order to fill these gaps in the research, I conducted a pilot study looking at the components of L2 reading among native Spanish-speaking adolescents with low L1 literacy enrolled in U.S. high schools. I ultimately found that L1 reading comprehension was the strongest predictor of L2 reading

comprehension. These results point to the need for more research including participants with both high and low levels of L1 literacy, and extending L2 reading research to adolescent ELLs in U.S. schools. The present study includes such participants in order to better address the question of the relative importance of L1 reading and L2 knowledge on L2 reading.

Research on L2 reading among older learners has not fully investigated the role of the L1 in the development of L2 reading. As noted previously, participants with low L1 literacy have not been included. Furthermore, L1 linguistic skills have generally not been investigated in adolescents although studies on children have shown a significant role for L1 linguistic skills in L2 reading. The study reported here aims to more fully investigate the role of the L1 in L2 reading. Thus, this study goes beyond the research program shaped by Alderson's question, looking at the role of both L1 and L2 linguistic skills in L2 reading, and including participants with both very low and high levels of L1 reading comprehension.

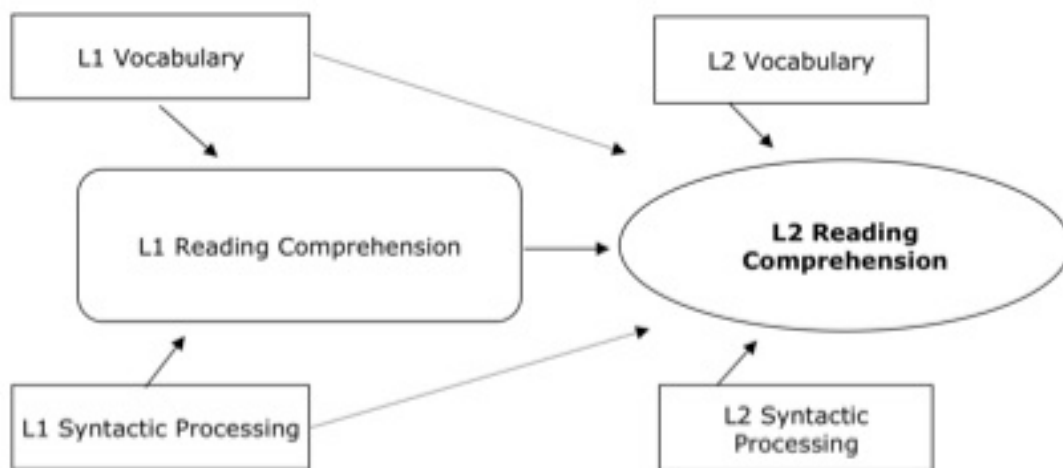
2. Background: Literature Review

2.1 Model of reading comprehension

We will adopt a componential approach to reading comprehension, which states that reading comprehension is a process with many separate components affecting the ability to comprehend printed material (Carr & Levy, 1990).

This study will examine the relative importance of the following components in L2 reading comprehension: L1 reading comprehension, L2 syntactic processing and L1 and L2 vocabulary. Many components which have been shown to be important in reading comprehension are not included here (e.g. phonological awareness, decoding, metalinguistic awareness). The component skills often emphasized in the literature on second language reading comprehension among adolescents are the focus here. The model of L2 reading comprehension assumed in this study is laid out in Figure 2.1.

Figure 2.1: Model of L2 Reading Comprehension



According to this model, reading comprehension in both the native language and the second language are predicted by vocabulary knowledge and syntactic processing in that

language—relationships that have been confirmed by previous studies. For example, a recent study by Van Gelderen, Schoonen, Stoel, De Glopper, and Hulstijn (2007) found that among adolescents who spoke Dutch (L1) as their dominant language and were learning English (L2), L1 vocabulary and syntax were significant contributors to L1 reading comprehension, and L2 vocabulary and syntax as well as L1 reading comprehension were significant contributors to L2 reading comprehension. Thus, the model in Figure 1 is essentially the same model Van Gelderen et al. (2007) confirmed among adolescent L2 learners. However, the relationship between L2 reading comprehension and L1 vocabulary was not investigated in Van Gelderen et al. (2007). In Figure 1 this relationship is indicated with a dotted line, as there is limited research on the relationship between L1 linguistic skills and L2 reading—the role of L1 language skills has received little attention in research into the acquisition of L2 reading comprehension among adolescents. Among children, some research has suggested a significant role for L1 linguistic skills in the development of L2 reading.

In the following sections I will look at a number of studies related to the model of L2 reading comprehension presented above. I will review studies on the acquisition of L2 reading among both children and adolescents.

2.2 Research on L2 reading comprehension among bilingual children

The majority of research on L2 reading focuses on children acquiring L2 literacy, and often word level skills are the focus rather than reading comprehension. The research suggests that among L1 dominant bilinguals learning to read in their L2, L2 proficiency and L1 literacy are important predictors of L2 literacy. The research also suggests that among this group, L1 language skills are important predictors of L2 literacy.

Furthermore, some research has suggested that the literacy gap between L2 learners and their monolingual peers closes when the L2 learners receive L1 literacy instruction (Slavin & Cheung, 2005).

Akinnaso (1993) cited a number of studies supporting this notion that L1 literacy instruction will result in higher L2 literacy achievement (Modiano, 1968; Moorfield, 1987; Troike, 1978). The studies found that those children who were first instructed in L1 reading evidenced higher L2 reading success than those children who received initial literacy instruction in their L2. For example, Modiano (1968) found that Chiapas Indian children in Mexico who started to read in their native language demonstrated better reading results in Spanish as a second language than the children who received reading instruction only in Spanish.

Slavin and Cheung (2005) conducted a “best-evidence synthesis” (Slavin 1986) of the literature on the benefits of instructing ELLs in bilingual programs versus English immersion programs. They looked at studies comparing the reading ability of students who were given reading instruction in either bilingual programs or English immersion programs. In order to include the studies in their synthesis of the research, the studies had to: either use random assignment to conditions or have a pretest in order to estimate the degree of comparability of the groups; include a measure of English reading as a dependent variable; and include only students who had been enrolled in the specified program for at least one year in an English-speaking country. The authors identified thirteen studies that met these criteria; all were conducted with students in elementary school. All of the studies looked at native Spanish-speakers. Of these thirteen studies, nine of them found that students receiving reading instruction in bilingual programs

outperformed the students who had received reading instruction only in English on a test of English reading. The remaining four studies found no difference between groups. These results suggest that learning to read in the native language is beneficial to learning to read in the second language and that L1 reading skills transfer to the L2.

In a study by Fitzgerald, Amendum, and Guthrie (2008) on first through third graders' English literacy acquisition, the authors found that native Spanish speakers instructed in English-only classrooms did not have statistically significant differences in performance on English reading comprehension from their monolingual English speaking peers. The study looked at the developmental trajectory of ELLs and monolingual English speakers, including one cohort of students from the first through second grade and another from the second through third grade. The students were given measures of reading fluency, comprehension, word reading, phonology and phonics. The growth of phonological awareness differed between the two groups, with the ELLs starting at a much lower level. But by the end of the second year, the ELLs caught up with the monolingual English speakers, with both groups performing equally well. The ELLs and the monolingual English speakers differed in performance significantly only on the word reading and phonics measures. The study found that the groups behaved similarly in reading comprehension and fluency, with similar growth patterns, and no significant difference in performance.

In interpreting the results from Fitzgerald et al. (2008) and explaining the difference in findings from previous studies, it is important to note that some of the native Spanish-speaking children appeared to be dominant English speakers during the time of the study. The authors did not focus on the proficiency levels of the students. They did

note, however, that the students were given English oral proficiency assessments by their schools. Different assessments were given at each school. At one school the range of scores on the L2 oral proficiency measure was 1 – 5, with 1 being non-English speaker and 5 being fluent English speaker, and the mean was 2.06. At the other school the range of scores was 1 – 6, with 1 being non-English speaker and 6 being fluent English speaker, and the mean was 3.95. Furthermore, at one school, a Spanish oral proficiency assessment was done at the end of the study. The scores ranged from 0 percentile to 73rd percentile, with a median of 4th percentile, suggesting that at least at one of the schools by the end of the study the majority of the children were dominant English bilinguals. An important distinction to make is that between L1 dominant bilinguals, balanced bilinguals and L2 dominant bilinguals. The results from Fitzgerald et al. (2008) could potentially suggest that among L2 dominant bilinguals, L1 literacy instruction may not be as important as in L1 dominant bilinguals.

In order to explain the results of the study, and the equal performance of the ELLs and the monolingual speakers, the researchers noted that the scores of the monolingual group were always about half a grade level above the scores of the ELLs, although this difference was not statistically significant. They suggested that this gap could widen in the higher grade levels, however, which could be why other research has found the difference in reading comprehension among these groups.

In Proctor, Carlo, August, and Snow (2005), the authors looked at reading comprehension in L2 English among 135 fourth grade native Spanish-speaking children. The goal of the paper was to formulate a model of reading comprehension in the L2. The authors focused on L2 skills and did not look at the role of L1 literacy skills in

formulating their model of L2 reading comprehension. However, they did look at differences in the L2 reading performance of students instructed in the L1 as compared to students instructed only in the L2. In their population, 69% of the students received initial literacy instruction in the L1 and 31% received initial literacy instruction in the L2. They found that those with initial L2 literacy instruction outperformed those with initial L1 literacy instruction in L2 listening comprehension, vocabulary and reading comprehension. However, the authors note that these differences could be due to the fact that some of the students with initial L1 literacy instruction had been in the United States for a short amount of time and had not received as much English instruction as the other students. Thus, the findings cannot be used to claim that children instructed initially in L2 outperform their peers who are first instructed in L1. But the findings do support the notion that starting instruction in the L2 can lead to efficient L2 literacy acquisition (the students with initial L2 instruction had a mean grade level score of 4.5). However, an important point made by the authors was that the students' grade level score of 4.5 was based on a score where the focus of reading was on decoding; the reading comprehension measure at the 4th grade level was more a test of decoding than text level comprehension.

With regard to the model of L2 reading comprehension, the authors found that L2 vocabulary knowledge, L2 listening comprehension, L2 alphabetic knowledge and L2 fluency all played important roles in predicting level of L2 reading comprehension. They suggest an initial model of L2 reading including aspects of oral language skills (vocabulary and listening comprehension) and decoding skills (alphabetic knowledge and fluency).

Lipka and Siegel (2007) compared native English speakers to ESL students in the development of English reading in a longitudinal study of children from kindergarten to third grade. Their main research question was: are the same predictors involved in reading skills in ESL students and native English speaking students? They looked at the predictor variables of phonological processing, syntactic awareness and memory processes; the dependent variable was English word reading. They found that at the third grade level the monolingual English speakers outperformed the ESL students only on syntactic awareness; there was no significant difference in performance on the other tasks by grade three. Notably the study did not include measures of reading comprehension. The difference in English syntactic awareness is an important finding, as this difference could indicate the importance of syntax in reading comprehension. This difference in performance on English syntax could lead to differences in reading comprehension in the higher grade levels between the native English speakers and the ESL students.

A study by Reese, Garnier, Gallimore, and Goldenberg (2000) found that among 66 bilingual children who participated in a longitudinal study, the Spanish literacy level in kindergarten and the English oral proficiency level in kindergarten both significantly predicted English reading in the seventh grade. The authors did not compare the significance of the two predictors, so we cannot conclude that one is a stronger predictor than the other. The following two studies reviewed did compare the importance of L1 reading skills and L2 proficiency in L2 reading.

Asfaha, Beckman, Kurvers, and Kroon (2009) looked at the contribution of L1 reading comprehension and L2 (English) proficiency on L2 reading in a population of fourth grade students in the African country of Eritrea. The students had five different

L1s and were given measures of L1 and L2 reading comprehension, in addition to a measure of L1 word reading. L1 and L2 proficiency were measured using a classroom-based assessment of performance of the students during one semester. Proficiency was intended to be a global measure, taking into account the students' language ability in reading, writing, listening and speaking.

Notably the students all exhibited low levels of reading in both their L1 and L2. Research on the literacy levels of students in Africa has suggested that the students have relatively low levels of literacy due to many factors including poor educational opportunities and programs. This population of students in some ways is similar to the students with low L1 literacy who come to the United States and are the participants in the study reported here; their low levels of literacy are due to limited or insufficient education in their home countries.

Although the L1 literacy levels of the students are low, Asfaha et al. (2009) found that both L2 proficiency and L1 reading comprehension were significant contributors to L2 reading comprehension, together accounting for 27% of the variance in L2 reading comprehension. L2 proficiency was the strongest contributor to L2 reading comprehension, uniquely accounting for 15% of the variance. L1 reading comprehension was also a significant contributor to L2 reading comprehension, uniquely accounting for 4% of the variance. This finding is in line with much of the research looking at the relative contribution of L1 reading and L2 proficiency on L2 reading.

Although L2 proficiency was found to be the strongest contributor to L2 reading, there are flaws in the proficiency measure that must be considered and should lead us to be cautious with the results. The use of teacher ratings for both L1 and L2 proficiency is

problematic. Not only were the scores based on a global measure of proficiency, but the students came from 21 different schools. Variability in the teacher ratings among the schools could have a strong effect on the ratings, and the ability of a student to read well (or poorly) in either language would certainly play a strong role in the teacher's assessment of the student's proficiency. It is not clear how the measure of proficiency differs substantially from a measure of reading ability, insofar as teachers likely weigh reading ability highly in an assessment of student performance over the course of one semester. This study speaks to the necessity of separating measures of L2 proficiency from measures of L2 reading – a difficult task – in order to have clear results on the relationship between the two.

In a study with 49 fifth and sixth grade students enrolled in bilingual programs, Royer and Carlo (1991) found that the student's L1 (Spanish) reading ability in the fifth grade was the strongest predictor of the student's L2 (English) reading ability in the sixth grade. L2 listening comprehension was also significantly related to L2 reading comprehension. Students were also assessed on L1 listening comprehension in this study, but no significant relationship was found between L1 listening comprehension in the 5th grade and L2 reading comprehension in the 6th grade. The authors concluded that reading skills transfer from a student's L1 to their L2 as reading is a skill related to cognitive academic language proficiency (CALP) whereas listening skills do not transfer from the L1 to the L2 as listening is a skill related to basic interpersonal communication skills (BICS)². Royer and Carlo claimed that their study supports Cummins' (1979; 1981)

²BICS is language proficiency used in everyday communication while CALP is language used in academic contexts. BICS is described as being context dependent whereas CALP is context reduced. This distinction between BICS and CALP was originally based on work by Skutnabb-Kangas and Toukomaa (1976) who found a disconnect between students' use of language out of school and their performance on academic

interdependence hypothesis which posits that there is a common underlying proficiency that a bilingual (or multilingual) individual draws upon when using all of his/her languages. Based on this hypothesis, students who have developed literacy and academic concepts in one language can easily transfer these to the other language; the cognitive abilities that a student has developed in one language are available to the student in another language due to the common underlying proficiency shared by the two languages.

Gottardo and Mueller (2009) argued that in order to get a more complete picture of L2 reading comprehension, both L1 and L2 linguistic skills need to be factored into an analysis of the components of L2 reading comprehension. They conducted such an analysis to test the simple view of reading which posits that reading comprehension is the product of decoding skills and oral language skills (Gough & Tunmer, 1986). Among children in the first and second grade with Spanish as their L1 and English as their L2, they found that L2 decoding and L2 vocabulary and syntax were the strongest and only significant predictors of L2 reading comprehension. However, the model of L2 reading comprehension was enhanced with the inclusion of the L1 measures of phonological awareness, vocabulary and syntax (note that they did not measure L1 decoding), although the L1 skills did not significantly factor into L2 reading comprehension after the L2 skills were taken into account. The analyses also indicated that the linguistic constructs of L1 and L2 phonological awareness, vocabulary and syntax were distinct skills in each language. Gottardo and Mueller concluded that “the results of the measurement model

tasks—the language proficiency outside of school did not appear to be predictive of their success in school. Cummins (1979, 1981) proposed two distinct types of language proficiency – basic interpersonal communication skills (BICS) and cognitive academic language proficiency (CALP) to formalize this distinction.

suggested that to obtain an adequate picture of predictors of reading comprehension in bilingual people, L1 and L2 predictors should be included. Theoretical models that test only L2 predictors are missing a potentially important piece of information because constructs are not identical in L1 and L2.” (p. 340-41).

Carlisle et al. (1999) also investigated the role of L1 linguistic skills in L2 reading comprehension among native Spanish-speaking children learning English. They looked at the role of L1 vocabulary and phonological awareness on L2 reading comprehension in children in the first, second and third grades. Contrary to Gottardo and Mueller (2009), they found a significant role for L1 linguistic skills on L2 reading comprehension. Using multiple regression analyses, they found that L2 vocabulary accounted for 13.5% of the variance in L2 reading comprehension and L1 vocabulary accounted for an additional 15% of the variance in L2 reading comprehension when it was entered into the model after L2 vocabulary. The discrepancy between the Carlisle et al. (1999) findings and the Gottardo and Mueller (2009) findings may be due to the other variables included in the models of reading comprehension. For example, Gottardo and Mueller found L2 decoding to be the most significant contributor to L2 reading comprehension, but Carlisle et al. did not include decoding in their model. Alternatively, it could be due to the populations included in the studies—the students may have had differing levels of L1 and L2 proficiency or may have had different types of instruction. However, both studies suggest the importance of including L1 linguistic skills in a study looking at the components of L2 reading comprehension.

Other studies conducted with native Spanish-speaking children learning English found significant roles for L1 linguistic skills in L2 reading, looking not at reading

comprehension but at other reading skills. Durgunoglu et al. (1993) found that L1 phonological awareness was a stronger predictor of L2 word reading than L2 phonological awareness among first grade students who spoke Spanish as their L1 and were acquiring English as their L2. Thus, the children who had better phonological awareness in Spanish were better at decoding words in English than those with poor phonological awareness in Spanish. And this relationship was stronger than that between English phonological awareness and English decoding. In Gabriele et al. (2009), a pilot study on the development of literacy in Spanish-English bilingual children ages 5-6, the children's L1 syntax had a greater influence on the L2 emergent literacy skill of listening comprehension than did their L2 syntax. Again, the relationship between the L1 linguistic skill had a stronger relationship with L2 literacy development than the same linguistic skill in the L2. These results suggesting a significant role of L1 linguistic skills in L2 reading may or may not hold for older learners with more developed L1 linguistic skills when L2 reading comprehension is the dependent variable.

The literature on L2 reading among children suggests that the L1 plays a significant role in learning to read in a second language. Many of the studies provide support for the linguistic interdependence hypothesis, in that skills developed in the L1 seem to transfer and be available to the learners in the L2. Based on this research, we can conclude that it is important to look at the role of the L1, in terms of both linguistic skills and reading skills, in the development of L2 reading comprehension. This will allow us to get a better picture of the components of L2 reading comprehension by looking at the role played by L1 linguistic skills, and by looking separately at L1 linguistic skills and L1 reading skills. Doing so will allow us to determine what skills transfer to the L2.

2.3 Research on L2 reading comprehension among adolescents/adults

The research on L2 literacy acquisition among adolescents generally focuses on the transfer of literacy skills from the L1 to the L2 and on the role of L2 proficiency. The research has shown that L1 literacy and L2 language knowledge (generally including syntax and vocabulary) are important components of L2 reading comprehension (see, for example, Bernhardt & Kamil, 1995; Shiotsu & Weir, 2007; Van Gelderen et al., 2007; Yamashita, 1999). That is, being a good reader in the L1 and knowing L2 vocabulary and syntax are predictors of being a good reader in the L2.

The two theories typically discussed in the research on L2 reading are the threshold hypothesis³ (Clarke, 1980) and the interdependence hypothesis (Cummins 1979, 1991). The threshold hypothesis posits that for L1 literacy skills to transfer to the L2, a learner must first reach a certain level of L2 language proficiency⁴. The interdependence hypothesis posits that L1 literacy immediately transfers to the L2 because reading is an underlying skill that is the same across languages. Both of these hypotheses are difficult to confirm. The threshold hypothesis cannot be verified because the threshold is not defined; what level of L2 knowledge does one have to reach in order to transfer L1 literacy? The interdependence hypothesis cannot be tested because how would one measure ‘immediate transfer’? And in order to measure L2 literacy, one must have some knowledge of the L2. Likely each theory has some truth to it in that there are aspects of reading in the L2 that are essentially the same as reading in the L1 (making

³ This is a different threshold hypothesis from that of Cummins (1981) which is prevalent in the bilingualism literature. The reading literature’s threshold hypothesis referred to here was formulated by Clarke (1980) and posits a threshold for L2 proficiency in the acquisition of L2 reading. Cummins’ threshold hypothesis posits a threshold of L1 proficiency in order to acquire an L2 and become bilingual.

⁴ As noted by Yamashita (1999), studies have not focused on defining this L2 proficiency level and what it involves.

inferences, for example). However, it is also true that in order to read in a language you must know some vocabulary and syntax of that language.

In the seminal paper ‘Reading in a foreign language: a reading problem or a language problem?’ Alderson (1984) discussed the threshold hypothesis and concluded that L2 reading can be both a language problem and a reading problem. Presumably, if the threshold hypothesis holds, at the beginning stages of L2 literacy acquisition the problem is a language problem, as the low level of L2 language proficiency blocks the use of L1 literacy knowledge. However, once a learner acquires enough L2 language knowledge in order to reach the threshold, the L1 literacy knowledge becomes a strong predictor of L2 reading. Alderson posited that if the threshold hypothesis is correct, we would expect to find that among a population of learners with high levels of L2 proficiency, the L1 literacy level will be the strongest predictor of L2 literacy, and among a population of learners with lower levels of L2 proficiency, the L2 proficiency will be the strongest predictor of L2 literacy. I will review a number of studies that look at the relative contribution of L1 literacy and L2 proficiency in L2 reading comprehension among adolescents with age-appropriate L1 literacy, some of which also test the threshold hypothesis.

Bernhardt and Kamil (1995) looked at the relative contribution of L1 reading comprehension and L2 proficiency to L2 reading comprehension among native English-speaking college students enrolled in three levels of Spanish classes. They found that L2 proficiency was the stronger predictor of L2 reading comprehension. The L2 proficiency measure was the level of Spanish class the student was enrolled in (there were three proficiency levels). L1 and L2 reading comprehension were measured by the Adult Basic

Learning Examination (ABLE) reading test. The students received a low and high level L1 reading measure. The L2 reading measure was a direct translation of the low-level English version.

Among the three proficiency groups, there was no significant difference on their performance on the L1 lower-level reading assessment. But on the more advanced version of the English ABLE, the two highest proficiency level students performed significantly higher ($p < .01$) than the lowest proficiency group. Both L1 reading measures were regressed against the Spanish reading scores, and only the advanced test was a significant predictor of L2 reading. All together, the L1 reading measures accounted for 29% of the variance in L2 reading when L2 proficiency was not included. However, when the level of L2 proficiency was included, L2 proficiency accounted for 38% of the variance in L2 reading and L1 reading accounted for 10% of the variance in L2 reading. Thus, the conclusion was that L2 proficiency level is a stronger predictor of L2 reading than L1 reading.

Brisbois (1995) looked at the relationship between L1 reading comprehension, L2 proficiency and L2 reading comprehension among 131 native English speakers learning French at the U.S. Air Force Academy. Similar to the students in the study by Bernhardt and Kamil (1995), those in Brisbois' study who were enrolled in higher level L2 courses had higher scores on L1 reading than those in lower level courses. The students with higher L2 proficiency also had higher L1 reading, suggesting that "language students opting to continue their L2 studies seem to comprise a select group of highly literate individuals" (p 574). Also, as Brisbois pointed out, the results from the study support the notion of transfer occurring both from the L1 to the L2 and the L2 to the L1, which could

also explain the higher L1 literacy scores among those with higher L2 proficiency and higher L2 literacy. Brisbois found that L2 vocabulary was the most significant predictor of L2 reading – stronger than L2 grammar and L1 reading. This is one of the few studies looking at the relative importance of L1 reading and L2 proficiency in L2 reading that also compared the importance of L2 vocabulary and syntax.

A study by Lee and Schallert (1997) tested the threshold hypothesis among adolescent L1 Korean students learning English (L2) enrolled in the U.S. equivalent of the ninth and tenth grades in Korea. The study looked at the contribution of L2 proficiency (measured by vocabulary and syntax) on L2 reading comprehension as compared to the contribution of L1 reading comprehension, and found that the students' L1 reading comprehension and L2 proficiency were both significant predictors of their L2 reading comprehension. The results indicated that L2 knowledge is a stronger predictor of L2 reading than L1 reading – L2 proficiency accounted for 57% of the variance of L2 reading and 30% was accounted for by L1 reading level.

The L1 reading comprehension measure was taken from tests issued by the Educational Research Center in Korea for ninth and tenth grade students and included four passages with multiple choice inferencing questions. The L2 reading comprehension measure was taken from the fourth grade level of the Metropolitan Achievement Test and included four passages with multiple choice questions. The L2 proficiency score was based on the combined scores of a vocabulary and syntax measure. The vocabulary measure was based on a fourth grade assessment and was a multiple choice test of synonyms, antonyms, definitions and analogies. The syntax measure was a

grammaticality judgment task in which the students were presented with written English sentences and had to decide if each sentence used correct or incorrect grammatical forms.

The goal of the study was to test the threshold hypothesis. Thus, the participants were placed into a total of six proficiency levels based on the measures of L2 vocabulary and syntax. The researchers argued that the data appear to support the threshold hypothesis in that the learners in the three lowest proficiency levels showed either no significant correlation or a low correlation ($r = 0.22$; $p = .05$) between L1 and L2 reading comprehension, whereas the learners in the highest proficiency levels showed high correlations between L1 and L2 reading comprehension, all significant at the .01 level. Thus, it seems that L1 literacy skills were transferred in the students with high levels of L2 proficiency, but have not yet transferred in the students with lower levels of L2 proficiency. The authors concluded that “whether or not a reader has reached the threshold level may be the deciding factor in success or failure in L2 reading” (p 714).

Of particular importance, as it relates to the aim of the study presented here, Lee and Schallert discussed the necessity of including students with a range of L1 literacy levels in looking at the relationship between L1 literacy, L2 literacy and L2 proficiency. Although the researchers noted the importance of including learners with low L1 literacy, they administered a grade-appropriate assessment (ninth - tenth grade) for L1 literacy and did not perform any analyses comparing the poor L1 readers and the proficient L1 readers. The study did not provide any information on how many students scored poorly on the assessment, and as the assessment was age-appropriate, the skill level of the poor readers is unclear. Moreover, it is not clear how the poor readers compare with the proficient readers in the relationship between L1 literacy, L2 literacy and L2 proficiency.

A comparison of the L1 literacy levels could shed light on how the acquisition process may differ among students with and without high levels of L1 literacy. Knowing the L1 literacy levels of the students in each group of L2 proficiency would be beneficial in addressing the relationship of all the variables. Furthermore, in order to have a better understanding of the role of L1 reading comprehension in L2 reading comprehension, participants with both low and high L1 literacy need to be studied. It is not enough to look at students with age-appropriate L1 reading ability when characterizing the role of L1 reading in L2 reading. Lee and Schallert realized the importance of this, but their study did not fully address the issue as the participants did not appear to have a large range of L1 reading ability and none of the analyses focused on those who did poorly on the assessment of L1 reading.

Bossers (1991) reviewed a number of studies that investigated the relative importance of L1 reading ability and L2 proficiency on L2 reading ability. Many of the studies discussed here were reviewed, with the addition of another study done by Bossers on adult native speakers of Turkish learning Dutch that tested the threshold hypothesis. In order to test the threshold hypothesis, the students were divided into two groups: those who were less skilled L2 readers and those who were more skilled L2 readers. The less skilled L2 readers' performance was influenced only by L2 proficiency; L1 reading was not significantly related to L2 reading among this group. For the more skilled L2 readers, their L2 reading ability was most significantly predicted by L1 reading and L2 proficiency was not a significant predictor of L2 reading. Bossers argued that these results support the threshold hypothesis in that at the beginning stages of L2 reading, L2 proficiency plays the most important role in L2 reading, whereas once a learner has

reached a more advanced level, the L1 can play a role in the reading ability of the students. When looking at all the students as one group, L2 proficiency was the strongest predictor of L2 reading. Bossers concluded that L1 reading skills can be transferred to the L2 only when a certain level of L2 knowledge has been acquired.

In the studies reviewed thus far, L2 proficiency has been shown to play the most important role in the development of L2 reading. An important question concerns what components of L2 linguistic knowledge are the strongest predictors of L2 literacy. The research differs on whether L2 vocabulary or L2 syntax is a stronger predictor of L2 reading. Until recently the research suggested that L2 vocabulary knowledge was the stronger predictor (Brisbois, 1995; Yamashita, 1999). However, Shiotsu and Weir (2007) found that L2 syntax was the more significant predictor of L2 reading among university students in both the UK and Japan. The students in the UK were learning English as their L2 and spoke a variety of L1s; the students in Japan all spoke Japanese as their L1 and were learning English. The measure of syntax was a multiple choice, fill in the blank task with answer choices that had similar semantic content but different syntactic features. The researchers noted the requirement that the test of syntax not rely heavily on context or semantics in order to ensure that it did not significantly overlap with the tests of reading comprehension or vocabulary. They used structural equation modeling in order to look at the relative importance of L2 vocabulary and L2 syntax on L2 reading comprehension and argued for the use of this more sophisticated statistical technique in research on the components involved in reading comprehension. They focused on L2 proficiency in looking at L2 literacy acquisition and did not include measures of L1 literacy because “it has generally been shown that L2 reading ability is better predicted

by the learners' L2 knowledge/proficiency level than their L1 reading ability at least until a certain level of L2 proficiency is developed" (p. 101).

Although many studies have shown that L2 proficiency is a stronger predictor of L2 literacy than L1 literacy, there are a few studies with differing results. For example, Van Gelderen et al. (2007) found that L1 literacy was a stronger predictor of L2 literacy than L2 proficiency in a longitudinal study with eighth through tenth grade L1 Dutch speakers learning English (L2). They included assessments of both L1 and L2 reading for three years, looking at the factors which influence L1 reading and those that affect L2 reading. They found that L1 reading comprehension was a stronger predictor of L2 reading than L2 vocabulary or grammar. They found similar patterns in both the L1 and the L2. For example, they found that L2 vocabulary is a significant predictor of L2 reading comprehension, just as L1 vocabulary is a significant predictor of L1 reading comprehension. They suggested that perhaps the results found in many studies on the significance of L2 proficiency on L2 reading support the notion that linguistic skills are important predictors of reading comprehension in any language (both the L1 and L2) and that it is true that the better your linguistic skills in a given language, the better of a reader you will be.

Carrell (1991) found conflicting results with respect to the relative importance of L1 reading versus L2 proficiency in L2 reading among two groups of university students. Both groups of students were enrolled in college in the United States; one group of students spoke Spanish as their native language and were learning English as a second language and the other group of students spoke English as their native language and were learning Spanish as a foreign language. Among the native Spanish-speaking students, the

level of L1 reading was the stronger predictor of L2 reading than L2 proficiency.

However, among the native English speakers, L2 proficiency was the stronger predictor of L2 reading. Unfortunately the L2 proficiency level was not directly measured; rather, the level of L2 proficiency was determined based on the class level the students were enrolled in.

Carrell (1991) posited that the differing results among the two groups in the study could be explained due to the different learning situations among the groups. This is an important point to consider, and is of particular relevance here. The populations included in the studies reviewed thus far on adolescent L2 reading comprehension have been conducted in large part in foreign language learning situations in which the students speak the dominant language as their L1 and are learning an additional language. And most of the studies have been conducted with college-level students. Thus, the research on L2 reading comprehension has generally not looked at adolescent students in a second language learning situation at the high school level, in which the students speak a minority language as their L1 and are learning the dominant language. Such students are the participants in the study reported here. It may be the case that students learning a foreign language will evidence a different pattern of L2 reading comprehension than students learning a second language, as Carrell suggests. Thus, sociolinguistic factors related to the context of language learning need to be considered in research on the acquisition of L2 reading comprehension.

The research on L2 literacy acquisition among adolescents has generally focused on the transfer of literacy skills from the L1 to the L2 and on the role of L2 proficiency in L2 reading. The model of L2 reading in Figure 1 has been supported by numerous

studies, showing that L1 literacy and L2 syntax and vocabulary are important components of L2 reading comprehension. Many of the studies on L2 reading comprehension aimed to address the threshold hypothesis and claim to support the threshold hypothesis in that they found a stronger role for L2 proficiency in L2 reading than for L1 literacy among students with lower levels of L2 proficiency. One study provided further evidence for the threshold hypothesis, finding that among a group of less skilled L2 readers L2 proficiency was the strongest predictor of L2 reading and among a group of more skilled L2 readers L1 reading was the most important predictor of L2 reading comprehension (Bossers 1991).

The threshold hypothesis is centered on the variable of L2 proficiency and as such focuses on students with a range of L2 skills and how those with low versus high L2 proficiency perform in L2 reading. The threshold hypothesis assumes that the learners have L1 literacy skills, but that the skills cannot transfer to the L2 until a learner has acquired a certain level of L2 linguistic skills. The threshold hypothesis does not consider the case of students with very low L1 literacy. Another threshold could exist in terms of L1 reading ability—if a student has low L1 reading ability, the level of L2 proficiency may not make as much of a difference in L2 reading as it would in students with higher levels of L1 reading ability, so that students who are very poor readers in the L1, even if they have relatively high levels of L2 oral proficiency, will not have relatively high levels of L2 reading comprehension. However, such a threshold for L1 literacy has not been investigated, in part because students with low L1 literacy have not been studied.

One important question is whether or not adolescents and adults with low L1 literacy levels can compensate for low L1 literacy by acquiring L2 linguistic skills and

succeed in becoming strong L2 readers. It could be the case that L2 linguistic skills are more important in reading in the L2 since the L1 literacy skills are very low. Or the L1 literacy levels could be the most significant predictor and the student may not be able to improve in L2 literacy although his or her L2 linguistic skills improve. The degree and nature of L1 transfer of skills has not been addressed among adolescents and adults with low L1 literacy. Thus, an important question remains: whether there is a 'threshold' of L1 literacy that must be reached in order to fully develop L2 literacy.

For adolescents with age-appropriate L1 literacy, research has suggested that L2 language skills constitute the most important factors in L2 reading comprehension (Bernhardt & Kamil, 1995; Lee & Schallert, 1997; Shiotsu & Weir, 2007). That is, although L1 reading ability plays a role in L2 reading success among adolescents, L2 proficiency has been found to be the stronger predictor. And among L2 skills, it is generally thought that L2 vocabulary is the strongest predictor of L2 reading comprehension (Brisbois 1995). However, a recent study by Shiotsu and Weir (2007) has called this into question, suggesting that L2 syntax may be a stronger predictor than L2 vocabulary. Thus, and despite some disagreements over the details, the consensus is that L2 proficiency is a more important factor in L2 literacy acquisition among adolescents than level of L1 reading ability.

However, this consensus regarding the predictors of L2 reading success among adolescents is based on studies with two important limitations involving the characteristics of the participants and the measures of L2 proficiency. The existing research on L2 reading comprehension among adolescents has included participants with age-appropriate levels of L1 literacy skills, but has not included those with low L1

literacy skills. Because the research has not included participants with a true range of L1 reading abilities, the role of L1 reading skill in L2 reading has not been addressed adequately. Instead of varying the L1 reading level, many of the existing studies have focused on students with a range of L2 proficiency levels in order to test the threshold hypothesis. That is, in studies of L2 reading comprehension the range of L2 proficiency has varied much more than the range of L1 reading ability. Thus the general agreement on the findings that L2 proficiency is the stronger predictor may be due to the larger range in L2 proficiency than L1 reading ability among the students included in the research. The answer to Alderson's question can only be answered satisfactorily if the students tested have both very low and high L1 reading skills, in addition to both very low and high language skills—otherwise, if everyone is a relatively good L1 reader but some have very low language skills, the problem will be seen in language skills rather than reading skills. Previous studies have given us some insight into the skills that are important in L2 reading comprehension. However, if studies include students with a true range of L1 literacy, as well as L2 proficiency (which is what existing studies have focused on), we can get a better picture of the relationship between L1 reading, L2 proficiency and L2 reading.

Another methodological problem with previous studies concerns the tasks used to measure L2 proficiency. Often they were global measures based on the course level the students were enrolled in or were based on teacher ratings. Both types of measures of L2 proficiency miss important information about the students' proficiency, as they do not directly measure specific aspects of L2 proficiency and are not very reliable measures. The studies that include actual L2 proficiency tests generally include written tests of

vocabulary and syntax. Hence, L2 proficiency level is being assessed using the medium of reading, which is then being used to predict reading ability. Therefore, the finding that L2 proficiency is a stronger predictor than L1 reading may be largely due to the simple fact that the measures of L2 proficiency are measures of L2 reading—L2 reading should be more closely related to itself than any other variable. In other words, an important question is whether the reason that previous research on L2 reading has found such a strong role for L2 vocabulary and syntax might be that the tests of L2 vocabulary and L2 syntax are testing not only L2 knowledge, but also L2 reading ability. The proposed study will disentangle L2 reading from L2 proficiency, isolating the variables from one another, in order to more properly discern the relationship between L2 reading and L2 knowledge.

Furthermore, the existing research on L2 reading comprehension among adolescents has not included newly arrived immigrant students in U.S. high schools. The different learning situations and characteristics of this population, as compared to those included in the previous research, may result in different findings with regard to the most important components of L2 reading comprehension.

2.4 Research on L2 literacy among adolescents/adults with low L1 literacy

The literature reviewed thus far has focused on either children learning to read in a second language or adolescents and adults who have age-appropriate levels of L1 literacy learning to read in a second language. As noted previously, in order to have a better understanding of the role of L1 literacy skills in L2 literacy skills, students with low levels of L1 literacy need to be included in the research program on L2 reading. There are very few studies on older learners with low L1 literacy who are learning to read in a second language. I will look at the results from one of the few studies on adolescents

and adults leaning to read in the L2 who have low L1 literacy. Young-Scholten and Strom (2006) reported on a study of the reading ability, phonological awareness, and linguistic competence of adolescent and adult immigrants learning English. Although the study did not focus on my exact research questions, it gives us some insight into the acquisition of L2 literacy among older learners with low L1 literacy.

The study looked at seventeen Somali and Vietnamese adolescents and adults learning English. The learning situation of the participants in Young-Scholten and Strom (2006) is similar to that of the students in the present study—they are all L1 speakers of minority languages learning English in the United States. Eight of the participants had no native language schooling and eleven had 1-5 years of native language schooling. The study focuses on the acquisition of basic reading skills and phonological awareness.

The participants were given measures of L1 and L2 literacy. The L1 literacy measure involved the participants reading part of a story and writing something about themselves. The L2 literacy task involved identifying letters, reading survival signs, a fill-in-the-blank multiple choice sentence completion task, reading words, reading a paragraph, and writing something about themselves. The study also measured L1 and L2 phonological awareness, with the same tasks in both languages, including word level, syllable level, onset/rhyme level and phoneme level tasks. The results are only reported for the L2 measures. The authors noted that the L1 tasks were always administered first and that the participants often did not understand the task until performing it in the L2. Thus, they did not believe that the L1 tasks were valid measures of L1 literacy and phonological awareness. Unfortunately, the study does not speak directly to the role of the L1 in L2 reading among learners with low L1 literacy.

The general research question in Young-Scholten and Strom (2006) was how L2 phonological awareness develops in non-literate adults, in comparison to how it develops in children and adults learning to read in their L1. Research has suggested that both children and adult L1 literacy learners succeed on word, syllable and sub-syllabic awareness tasks without literacy instruction, but only do well on phonemic awareness after schooling (Gombert, 1994; Lukatela, Carello, Shankweiler, & Liberman, 1995; Morais, Cary, Alegria, & Bertelson, 1979; Morais, Alegria, & Content, 1987). The results reported by Young-Scholten and Strom show the same general pattern in adults learning to read in an L2. Among those without schooling, phonemic awareness is inferior to word and syllabic awareness. The study also found a relation between phonemic awareness and single word decoding ($r = .886$; $p < .01$). All the students with phonemic awareness also had decoding skills, and vice versa.

Another goal of the study was to look at the extent of L2 morpho-syntactic competence necessary to support a non-literate adult's reading development in a second language. L2 linguistic competence was assessed using an oral elicitation task in which the students were shown a picture and given five minutes to describe it. In order to address the relation between the L2 literacy and the L2 morpho-syntactic competence of the students, the students were placed into five L2 reading levels based on the L2 literacy tasks and five L2 proficiency levels based on the picture description task. It is important to note that all of the students in the lowest L2 reading level (Level 1) were the students who had not received schooling in their native language. The researchers found that the students in the lowest levels of syntax (Levels 1 and 2) were the exact same students who were in the lowest levels of L2 literacy (Levels 1 and 2). The relationship between syntax

and reading was confirmed with a correlation of the entire group ($r=.942$; $p < .001$). It is interesting to note that this correlation was not significant for the Vietnamese learners. Because the majority of the Vietnamese participants had received some native language education, the researchers concluded that syntax level matters for the unschooled learners “when there are no native language reading skills available to transfer” (p. 61). They argued that “[L2] Morpho-syntactic competence turns out to be most clearly connected to unschooled learners’ ability to read [in the L2]” (p. 62). As the importance of the L1 reading ability of the students was not directly measured in the study, further research is needed in order to support these conclusions.

The Young-Scholten and Strom (2006) study gives us some insight into the acquisition of L2 literacy among adults with low L1 literacy. It appears that phonological awareness develops in the L2 similarly to how it develops in the L1 among both children and adults. Also, the students who had no education in the L1 were the poorest readers in the L2, suggesting that even a limited amount of L1 instruction has a positive impact on L2 literacy acquisition. However, due to the absence of an L1 literacy measure and the absence of a measure of reading comprehension, the results here cannot be used to directly address my research questions. It does appear that L2 syntax is an important predictor of L2 reading, but the relative importance of this component of L2 reading, as compared to L2 vocabulary and L1 reading, cannot be addressed.

2.5 Conclusion

To summarize, the research on L2 reading comprehension, among both children and adolescents with age-appropriate L1 literacy, has supported the model of L2 reading comprehension presented in Figure 1. L2 reading is influenced by L2 vocabulary and

syntax in addition to L1 reading. Among children, some of the research suggests that L1 reading skills may be the most significant contributors to L2 reading skills. However, the research on children has generally not addressed the specific research question of this study—namely, whether L1 reading ability or L2 linguistic knowledge is more important in the development of L2 reading comprehension. And among the two studies that did address this question, each found a different result—in one case L2 proficiency was found to be the strongest predictor (Asfaha et al., 2009), and in the other L1 reading comprehension was found to be the strongest predictor (Royer & Carlo, 1991).

The research among adolescents has focused on this question, and a general consensus is that L2 proficiency is the most important component in L2 reading comprehension. However, research on adolescent learners has only included participants with age-appropriate L1 reading ability. Furthermore, the research on adolescent learners has not focused on newly arrived adolescent ELLs in U.S. schools. Research on this population is lacking and educators are calling for more information on how to meet the educational needs of these students (Freeman & Freeman, 2002; Francis, Rivera, Lesaux, Kieffer, & Rivera, 2006; Short & Fitzsimmons 2007). The research on L2 reading among adolescents has focused on L2 learners in a foreign language learning environment, where the students speak the majority language as their L1 and are learning an additional language. The findings from the previous research may or may not hold for newly arrived adolescent students in U.S. schools who have low levels of L1 reading skills. Research on this population of students is needed in order to address the relative importance of L1 reading ability and L2 proficiency in L2 reading comprehension. Due to the lack of

research on older learners with low L1 reading ability, the importance of L1 reading ability in L2 reading comprehension has not been adequately addressed.

3. Background: Pilot Study

Previous research on the development of L2 reading comprehension among adolescents has focused on students with age-appropriate L1 reading skills and has generally been conducted with students in foreign language learning situations. Research on second language learners in the United States with low L1 reading skills is lacking. Research on this population is needed in order to understand their development of L2 reading. The previous research findings may or may not hold when looking at adolescents with low levels of L1 literacy. Such students have not been investigated, and we thus do not have a complete understanding of the role of L1 reading in L2 reading. I conducted a pilot study on the development of L2 reading comprehension among adolescents with low L1 literacy in order to tentatively address some of the gaps and methodological problems in the previous research. In order to get a clear picture of the role of the L1 in the development of the L2, students with a range of L1 skills need to be studied. The study investigated the relative contribution of L2 vocabulary, L2 syntactic processing, L1 syntactic processing, and L1 reading comprehension on the L2 reading comprehension of 9th grade Spanish-speaking students with low L1 literacy learning English who had been in the United States for two years or less. Research on this population of students has not been included in the research program on L2 reading comprehension, and little is known about the development of L2 reading among newly arrived adolescent immigrant students in U.S. schools with limited L1 academic skills.

3.1 Research questions and hypotheses

The specific research questions of the pilot study were:

What are the predictors of reading comprehension in a second language (L2) among adolescents with low native language (L1) literacy? Which of the following are the strongest contributors to L2 reading comprehension?

- a. L1 reading comprehension
- b. L1 syntactic processing
- c. L2 syntactic processing
- d. L2 vocabulary knowledge

One goal of the pilot study was to investigate how adolescents with low L1 literacy compare to children and adolescents with age-appropriate levels of L1 literacy in their development of L2 reading comprehension. There is a disconnect in the literature among these populations. Among the children studied, evidence suggests that L1 reading and language skills are stronger predictors of L2 reading than L2 proficiency (Carlisle et al., 1999; Durgunoglu et al., 1993; Royer & Carlo, 1991; Slavin & Cheung, 2005). Among the adolescents studied, research suggests that L2 proficiency is a stronger predictor of L2 reading than L1 reading (Bernhardt & Kamil, 1995; Brisbois, 1995; Lee & Schallert, 1997). The older learners with low L1 literacy are similar to both children learning to read in an L2 and adolescents and adults learning to read in an L2 who have age-appropriate L1 literacy. Adolescents with low L1 literacy are similar to the older learners generally studied in L2 literacy acquisition in terms of age and L1 oral skills, but they lack L1 literacy skills. They are similar to younger learners in that both populations lack developed literacy in any language; however, the adolescents are different from children in that they are older and have more fully developed L1 language skills. They also differ from children in that they have less time to acquire L2 literacy skills. Looking at the behavior of this population can also help synthesize the research on the younger and older learners and potentially explain the different relationships of L1 reading and L2 proficiency in these populations. Furthermore, the research on children's development of

L2 reading has included many studies of native Spanish-speaking students learning English in U.S. schools, while these students have not been included in the research on L2 reading among adolescents. Therefore, the learning environment is more similar between the population in the pilot study and the participants in the research among children.

Based on the research on L2 literacy acquisition among children and older learners with high levels of L1 literacy, it appears that developing systems more strongly influence other developing systems, while systems that are not developing do not evidence a strong relationship with developing L2 literacy skills. This could explain why adolescents and adults with well-developed L1 literacy evidence L2 linguistic skills being the strongest predictor of L2 literacy, as both L2 linguistic skills and L2 literacy skills are in the process of developing. It could also be why children's L1 linguistic skills predict their L2 literacy. Presumably if this is because the systems are both in development, adolescents and adults who have fully developed L1 linguistic skills will not evidence such a strong relationship between L1 linguistic skills and L2 literacy. We may also find among adolescents and adults who are developing L1 literacy skills and L2 linguistic skills that L1 literacy skills will have as strong a predictive power on L2 literacy as L2 linguistic skills.

Based on the review of the literature and the points noted above, we can formulate some hypotheses as to the comparative role of L1 reading comprehension and L2 knowledge in L2 reading comprehension. It may be the case that the research findings on the role of L1 literacy in older learners are due to the fact that the learners have well-developed L1 literacy and are still in the process of developing L2 literacy. If these

findings are an artifact of the data, then we would expect that in older learners with low L1 reading comprehension, the comparative importance of L1 reading comprehension will be greater than in older learners with more fully developed L1 reading comprehension. Thus, the role of L1 reading comprehension may play the most important role in L2 reading comprehension in both children and older learners, but the research on those with high levels of L1 literacy does not evidence this.

Furthermore, investigating the relationship of low L1 literacy on L2 literacy can give us insight into the transfer of literacy skills, and bring us closer to understanding the role of L1 literacy on L2 literacy. As the research has not been done on those with very low L1 literacy, we do not know how L2 literacy acquisition will be affected by such low levels of L1 literacy, and we do not know whether L2 linguistic skills will still be a stronger predictor of L2 reading comprehension.

3.2 Participants

The participants in the pilot study are a special population of English Language Learners (ELLs), labeled Students with Interrupted Formal Education (SIFE) in New York City. The students are ELLs with gaps in schooling who have low native language literacy. The data from the pilot study come from a research project done through the Research Institute for the Study of Language in Urban Society (RISLUS), commissioned by the New York City Department of Education, with the goal of better understanding and characterizing SIFE. The pilot study looks at data on 39 SIFE enrolled in the 9th and 10th grades in one of five NYC public high schools. The students range in age from 14 to 18, with an average age of 16. The students all speak Spanish as their native language. They had been in the US for an average of 1.2 years at the beginning of data collection.

Although the students were all labeled as SIFE, only nine of them reported missing some school. However, these students have low L1 literacy because of lack of instruction and education and not because of a learning difficulty or reading problem⁵. Looking at this group and the role of the L1 versus the L2 will give us more insight into the acquisition of L2 literacy.

3.3 Materials

The students received the following measures: 1) academic reading comprehension assessment in L1 and L2; 2) vocabulary assessment in L2; 3) assessment of complex syntax in L1 and L2. The academic reading comprehension and vocabulary measures were taken from an assessment designed during the research study and are written multiple choice tests. The assessment of syntactic processing was designed by RISLUS and tests the comprehension of complex syntactic structures through listening.

3.3.1 Reading Comprehension and Vocabulary

Both reading comprehension and vocabulary were assessed using the *Academic Language and Literacy Diagnostic (ALLD)*. The *ALLD* was designed by the RISLUS research team as part of the SIFE project. The *ALLD* consists of parallel versions in English and Spanish and is a cumulative assessment with items adapted from the *Stanford Achievement Test Series, Tenth Edition* and *Aprenda 3: La prueba de logros en español, Tercera edición* tests published by Pearson.

The reading comprehension section of the *ALLD* requires the students to read a passage and answer multiple-choice questions about the passage. The passages are either informational or functional; informational passages are non-fiction (e.g. a story on

⁵ In a larger study on the skills of SIFE, the students were given assessments of working memory, L1 syntactic development and basic literacy skills. The students had average working-memory, typical L1 development and basic decoding-skills.

mosquitoes) and functional passages convey information encountered in everyday life (e.g. a newspaper ad for employment). The questions assess basic understanding and higher-level skills such as critical analysis, strategies, and interpretation.

The vocabulary portion of the *ALLD* consists of three item types: synonyms, multiple meaning words and context clues. The synonym section requires a student to choose a synonym for a printed word. The multiple meaning words section provides a target sentence, and four subsequent sentences all containing the same word used in four different ways. The student must select the sentence in which the word is used in the same way as in the target sentence. The context clues section provides a target sentence with an underlined word; the target sentence provides a clue to the meaning of the underlined word. The student must choose the meaning of the underlined word. See Chapter 6 for a more detailed description of the *ALLD* (it is used in the larger study reported here).

3.3.2 Syntactic Comprehension

The measure of syntactic comprehension is designed to evaluate the acquisition of sentence structure independently from vocabulary. Previous studies of monolingual children have established that the structures targeted in this test are benchmarks in native language development, and are mastered by age ten (Hsu, Cairns, & Fiengo, 1985; Sheldon, 1974). Besides being indicators of typical language development, these structures also occur frequently in scholastic texts.

The test combines listening comprehension and picture selection in a task that can be administered individually or in groups. The student hears a sentence twice, and looks at three pictures. The student is then asked to choose the picture that corresponds to the

sentence. This measure was also used in the larger study; see Chapter 6 for a more detailed description and Appendix A for sample items.

3.4 Results

In addressing my research questions, I will use the data from 39 SIFE in order to determine whether there is a relationship between all the predictor variables and L2 reading comprehension. In order to determine the relative contribution of the predictor variables on L2 reading comprehension, I will include all of the predictor variables with a significant correlation with L2 reading comprehension in a linear regression, with L2 reading comprehension as the dependent variable.

Table 3.1 includes the descriptives for all of the variables. The reading comprehension and vocabulary measures are taken from the ALLD, a test designed to determine the grade level score of a student on each measure. Therefore, the results are reported as average grade level for these tasks. The results of all other measures are reported as percent correct.

Table 3.1: Descriptives

	L2 Reading Comprehension	L1 Reading Comprehension	L2 Vocabulary	L2 Syntax	L1 Syntax
M	38%	57%	41%	59%	89%
(SD)	(12.9)	(13.9)	(15)	(19)	(14.5)
Range	18% - 70%	35% - 83%	21% - 90%	29% - 93%	50% - 100%
Grade Level	3	3.5	4	NA	NA
(SD)	(2)	(1.3)	(3)		
Range	<2 - 5	<2 - 5	<3 - 9		

The students score far below the expected grade level of 9th and 10th grades on reading comprehension in the L1, with a reading level of between 3rd and 4th grade. This shows that the population is truly a group with low L1 reading skills. The only task the students do well on is the L1 syntax test. This shows that the students have well-

developed L1 syntactic processing skills. The L2 tasks were given to the students a year after the L1 tasks. The L2 scores indicate that the students are still in the process of acquiring English, with L2 vocabulary at the 4th grade level and a syntax score of 59% correct.

Table 3.2 shows the correlations for each of the predictor variables with L2 reading comprehension. The variables are listed from strongest to weakest correlations.

Table 3.2: Correlations between all Predictor Variables and L2 Reading Comprehension

	English Reading Comprehension
English Vocabulary	$r = .676^{***}$
Spanish Reading Comprehension	$r = .605^{***}$
English Syntax	$r = .474^{**}$
Spanish Syntax	$r = .320^*$

*** = significant at the .001 level

** = significant at the .01 level

* = significant at the .05 level

All of the independent variables are significantly related to L2 reading comprehension. L2 vocabulary appears to have the strongest relationship with L2 reading comprehension, followed by L1 reading comprehension. And both L2 and L1 syntax are significantly correlated with L2 reading, but L2 syntax has a stronger correlation than L1 syntax.

In order to look more closely at the relationship of the predictor variables and L2 reading comprehension, I did a regression analysis, including all of the predictor variables. L2 vocabulary was a significant predictor ($p < .01$) of L2 reading, accounting for 43% of the variance in L2 reading comprehension. L1 reading comprehension approached significance ($p = .07$), and accounted for 29% of the variance in L2 reading

comprehension. All other predictor variables were not significant contributors to L2 reading. Thus, it appears that L2 vocabulary is the strongest contributor to L2 reading comprehension. This is in line with much of the research on L2 reading among adolescents with age-appropriate levels of L1 reading comprehension.

In order to further explore the relationship between L2 vocabulary and L2 reading comprehension, I looked at the three subskills in the vocabulary measure: synonyms, multiple meaning words and context clues. I computed the correlations among these subskills and L2 reading comprehension; these are shown in Table 3.3.

Table 3.3: Correlations between L2 Vocabulary Subskills and L2 Reading Comprehension

	English Reading Comprehension	English Vocabulary: Synonyms	English Vocabulary: Multiple Meaning Words	English Vocabulary: Context Clues
English Reading Comprehension	—			
English Vocabulary: Synonyms	$r = .426^{**}$	—		
English Vocabulary: Multiple Meaning Words	$r = .498^{***}$	$r = .336^*$	—	
English Vocabulary: Context Clues	$r = .555^{***}$	$r = .191$ (ns)	$r = .359^*$	—

*** = significant at the .001 level

** = significant at the .01 level

* = significant at the .05 level

As seen in Table 3.3, all the vocabulary subskills correlate with reading comprehension, with the synonyms having the weakest correlation. Furthermore, the synonyms are not significantly correlated with the context clues items and have a weak correlation with the multiple meaning words items. Thus, the subskills appear to be differentially related to one another and to reading comprehension.

Recall that one of the methodological issues with previous research was that the independent variables were not always necessarily measuring a unique construct. The vocabulary measure used in this study required a great deal of reading. The multiple-meaning words items and the context clues items both require skills that look very much like reading comprehension. The multiple-meaning words items require the student to read five long sentences, and then pick one of four sentences in which the target word means the same as it does in the target sentence. The student must read complex sentences and comprehend them all in order to determine in which sentence one word means the same as in the target sentence. The context clues items require thinking skills in order to determine the meaning of an unknown word based on the surrounding sentence. This type of item is often included in tests of reading comprehension. As noted by Koda (2007), “Because incidental word learning requires inferring word meaning based on local text information, its success depends on the ability to build local text meaning” (p. 6). And building local text meaning is a skill that is involved in reading comprehension. Finally, the synonyms items appear to require the least amount of reading comprehension skills, and tests whether the student knows the meaning of a word by having them choose a synonym for the target word. All of these measures require some reading in the L2, but the amount and nature of reading in the synonyms items is the most distinct from that required in the reading comprehension measure.

In order to get a better picture of the role of L2 vocabulary in L2 reading comprehension, I performed another analysis including only the synonyms items as a measure of L2 vocabulary. This portion of the vocabulary assessment is the closest to a strict measure of vocabulary that does not also measure reading comprehension. Table

3.4 shows the correlations of the predictor variables with English reading comprehension, but includes only synonyms for the vocabulary measurement.

Table 3.4: Correlations between Modified Predictor Variables and L2 Reading Comprehension

	English Reading Comprehension
Spanish Reading Comprehension	r = .605***
English Syntax	r = .474**
English Vocabulary: Synonyms	r = .426***
Spanish Syntax	r = .320*

*** = significant at the .001 level

** = significant at the .01 level

* = significant at the .05 level

Here one can see that when the multiple-meaning words and context clues items are subtracted from vocabulary, the relationship between L2 vocabulary and L2 reading decreases. L1 reading comprehension now has the highest correlation with L2 reading comprehension.

The regression results with the edited vocabulary measure shows that L1 reading comprehension accounts for 43% of the variance in L2 reading comprehension ($p = .01$). Now L2 vocabulary accounts for 14% of the variance in L2 reading comprehension; this result is not significant ($p = .13$). All of the other predictor variables were non-significant. Thus, when the predictor variables are not confounded with the dependent variable of L2 reading comprehension, we find that L1 reading comprehension is the strongest predictor of L2 reading comprehension.

3.5 Discussion

My research questions on the relative importance of the component skills of L2 reading comprehension were formulated based on the existing research on L2 literacy acquisition. Research on children's acquisition of L2 reading suggests that L1 literacy and L1 linguistic skills are the most significant predictors of L2 reading. Research on L2 literacy among older learners with age-appropriate L1 literacy suggests that L2 linguistic skills, generally including syntax and vocabulary, are the strongest predictors of L2 reading. Thus, the existing research appears to suggest that the comparative importance of the predictors of L2 reading comprehension differ among children and older learners. The question of how adolescents with low L1 literacy compare to these groups was one goal of the pilot study—What is the strongest predictor of L2 literacy among this population? Is it L1 literacy and linguistic skills, as in children, or is it L2 linguistic skills, as in adolescents with age-appropriate L1 literacy?

As reported above, initially the results appear to suggest that L2 linguistic skills are the strongest predictors of L2 reading comprehension among older learners with low L1 literacy, leading to the conclusion that L2 literacy acquisition is similar for adolescents with varying levels of L1 literacy, but is different for older and younger learners. However, when I looked further into the L2 vocabulary measure and analyzed each section separately, deleting the items with the most reading required, L2 vocabulary had a weaker relationship with L2 reading among the older learners with low L1 literacy and L1 reading comprehension was the strongest contributor to L2 reading comprehension. These results suggest that measuring L2 linguistic knowledge with tests requiring L2 reading can lead to finding an exaggerated relationship between L2

language skills and L2 reading skills. The findings support the need to use measures that do not confound the two variables.

The answer to the original question of whether older learners with low L1 literacy differ from older learners with high levels of L1 literacy remains unclear. As the other studies on L2 literacy acquisition also include L2 measures of vocabulary and syntax that overlap with L2 reading comprehension, the comparisons cannot be made. One needs to measure L2 knowledge in older learners with age-appropriate L1 literacy in ways that do not require L2 reading comprehension. Thus, we do not know if the results among the older learners with L1 literacy are due to a confounding of measures or due to the fact that the L1 literacy is developed in these learners. As previously discussed, it could be the case that developing systems are more closely related to other developing systems and thus in learners with developed L1 literacy, L2 proficiency is more closely related to L2 reading.

It may, on the other hand, be the case that L1 literacy plays the most significant role in predicting L2 literacy in all populations studied. Research on children suggests that L1 reading comprehension ability is the most important factor in L2 reading comprehension. And the results reported above show that L1 reading comprehension is the most important predictor of L2 reading comprehension. This may be the case with the adolescent population, but the research has not shown this (and in fact has shown that L2 proficiency is the more important predictor) because the students studied have not had a true range of L1 reading comprehension. It may also be the case that the previous measures of L2 proficiency were overlapping with measures of L2 reading

comprehension and thus had a stronger relationship with L2 reading comprehension than the L1 reading tasks.

The finding that L1 reading comprehension has the strongest relationship with L2 reading comprehension is important in that it suggests that even low levels of L1 reading can transfer to the L2 and play a strong role at the beginning stages of L2 reading development. An important question raised by these results is whether or not a similar study, with appropriate measures of L2 linguistic skills, including adolescents with a true range of L1 literacy, will have similar results. It may be the case that previous studies on adolescents with normal levels of L1 literacy found an exaggerated relationship between L2 reading comprehension and L2 linguistic skills, as did my pilot study, due to confounding the two variables, and due to the small range of L1 literacy skills among the students. Or, it may be that in students with normal levels of L1 literacy, the components of L2 reading comprehension differ from those with low levels of L1 literacy. There may be a threshold of L1 reading, and as L1 reading improves, L2 linguistic skills will play a more important role in the development of L2 reading comprehension.

The larger study reported here aims to address some of the questions raised in the pilot study and to further investigate the role of L1 reading and language skills in L2 reading comprehension among newly arrived adolescent ELLs in U.S. schools. The pilot study included only those newly arrived adolescent immigrant students who had low L1 academic and literacy skills. The larger study includes newly arrived adolescent immigrant students who have a range of L1 academic and literacy skills. The findings from the pilot study may or may not hold when looking at a more heterogeneous population.

4. Research Questions and Hypotheses

4.1 Research Questions

This study will look at the development of reading comprehension in a second language, and ask whether a stronger role is played by existing reading skills (tested in the L1) or linguistic knowledge (encompassing knowledge of both L1 and L2). This is the overarching research question and will be the starting point of the analyses, but will be broken down as described below.

The dependent variable is L2 academic reading comprehension. The following are the independent, or predictor, variables in the study:

Linguistic skills

- L1 academic vocabulary
 - Oral
 - Reading
- L2 academic vocabulary
 - Oral
 - Reading
- L2 syntactic processing

Reading skills

- L1 reading comprehension
 - Academic reading comprehension
 - Basic reading comprehension

Using multiple regression analyses, the study will look at which of the predictor variables are significant contributors to L2 reading comprehension, and will ask which account for the most variance in L2 reading comprehension.

L1 and L2 vocabulary knowledge will be analyzed separately in order to determine the role of each in L2 reading comprehension. And because within L2 linguistic skills both vocabulary and syntax are included, these will be examined separately to determine their relationship with reading comprehension.

The vocabulary measures will include a number of subtests, some of which require reading and some that do not, in order to address the question of whether the strong relationship between L2 vocabulary and reading comprehension in previous studies could be in part due to the tests of vocabulary also testing reading.

The L1 reading comprehension variable will be measured with two tests: a parallel version of the English reading comprehension test, in the format of those generally given in an academic setting, and a test designed to tap into higher-level comprehension skills without the interference of complex syntax and vocabulary. I will call the former the measure of L1 academic reading comprehension and the latter the measure of L1 basic reading comprehension.

The more detailed research questions of the study are:

- Do linguistic skills in the L1 or the L2 have a stronger relationship with L2 reading comprehension?
- Within the L2, does syntax or vocabulary have a stronger relationship with L2 reading comprehension?
- Does reading vocabulary have a stronger relationship with L2 reading comprehension than oral vocabulary? Does the relative importance of L2 academic vocabulary in L2 reading comprehension lessen when only including vocabulary items that do not require significant amounts of reading?
- What is the relationship between L1 reading comprehension and L2 reading comprehension? How does this compare with the relationships between L2 reading comprehension and the other predictor variables? Is the relationship different when looking at the two L1 reading comprehension tests separately?

- Consistent with the threshold hypothesis, will the relative contribution of L1 reading comprehension to L2 reading comprehension depend on the level of L2 proficiency (as measured by vocabulary) of the participants? Or will there be evidence for another threshold for L1 reading comprehension, which would be consistent with a finding that the relative contribution of L2 proficiency depends on the level of L1 reading comprehension of the participants? In other words, will there be an interaction between the predictor variables of L1 reading comprehension and L2 vocabulary?

The above questions will be addressed with analyses of all participants together in one group. I will also look separately at different groups of students, first based on their level of L1 literacy and second based on their level of L2 proficiency, asking the following questions:

- Will the components of L2 reading comprehension play different roles in those with low versus high levels of L1 literacy?
- Will the components of L2 reading comprehension play different roles in those with low versus high levels of L2 proficiency?

4.2 Hypotheses

As noted earlier, the existing research on L2 reading among adolescents suggests that L2 linguistic knowledge, specifically vocabulary, plays the most important role in L2 reading comprehension. However, this research has not included participants with a large range of existing L1 reading ability, has included measures of L2 linguistic knowledge that also measure L2 reading ability, has not looked at the role of L1 linguistic skills, and has not included newly arrived immigrants enrolled in U.S. high schools but has been

conducted mostly with college-level students learning a foreign language. It may turn out that even with these factors accounted for in this study, I will find that L2 linguistic skills (specifically vocabulary) play the most important role in L2 reading comprehension, over and above that of L1 reading ability and L1 linguistic skills. However, based on the pilot study I conducted on adolescents with low L1 literacy, as described in Chapter 3, I predict that L1 reading ability will be the strongest predictor of L2 reading comprehension, above that of L2 linguistic skills. Therefore, I expect to find that reading-specific skills are more important than language-specific skills in the development of L2 reading comprehension. This is not to say that linguistic skills do not play a role in the development of L2 reading comprehension. I expect to find that L2 vocabulary and syntax will both have a significant relationship with L2 reading comprehension. I also hypothesize that L1 academic vocabulary will play a role in the acquisition of L2 reading comprehension. This is especially likely given the close relationship between Spanish and English and the number of words that have common roots or that have been borrowed between the languages. The English vocabulary measure includes 23 (out of a total of 39) target words that have a similar sound, meaning, or spelling as a related word in Spanish.

For the question about the relative importance of L1 versus L2 linguistic skills, I predict that L2 vocabulary and syntax will have a stronger relationship with L2 reading comprehension than will L1 vocabulary. This is in line with the previous research on the components of L2 reading comprehension among older learners and the importance of L2 linguistic skills. Although I do hypothesize that L1 reading comprehension will play a more important role than L2 linguistic skills, I believe this to be the case due to the reading-specific skills present in the L1 and not due to the linguistic skills present in the

L1. Although L1 vocabulary will likely be related to the L2 reading, I believe L2 vocabulary and syntax will have a stronger relationship.

As just noted, I hypothesize that the linguistic skills of L2 vocabulary and syntax will be significant predictors of L2 reading comprehension. And within these skills, as in my pilot study, I believe that L2 vocabulary will play a stronger role. The measures of L2 vocabulary test academic vocabulary knowledge and are therefore measuring cognitive academic language proficiency (CALP) to a greater degree than basic interpersonal communication skills (BICS)⁶. On the other hand, the syntax test is more a measure of BICS and CALP, as the structures tested range from relatively simple coordination to more complex subordination. These structures are part of everyday oral language, although the more complex structures are arguably more common in written texts encountered in academic settings. The dependent variable is a measure of academic reading comprehension and as such relies on a student's CALP in order to understand the texts and answer the comprehension questions. Due to the nature of the measurements, I hypothesize that L2 academic vocabulary will be more closely related to L2 academic reading comprehension than will L2 syntax.

Within the academic vocabulary measures, both a reading vocabulary and an oral vocabulary test were given to the participants. The reading vocabulary test includes three subsections, testing synonyms, multiple meaning words, and context clues. Each subtest requires unique skills and different amounts of reading to complete. These are the same skills that were tested in the pilot study. Recall that in the pilot study, the subsections of the ALLD reading vocabulary test were differentially related to each other and to L2 reading comprehension, with the items requiring the most reading and the skills most like

⁶ See footnote defining BICS and CALP on p. 16.

those involved in reading comprehension having a stronger relationship with reading comprehension than the items that were measures of pure vocabulary. This issue is one that could explain why so many previous studies found such a strong relationship between L2 vocabulary and L2 reading comprehension – the L2 vocabulary tests were measuring skills that the L2 reading comprehension tests were also measuring and therefore a very strong relationship would exist between the two. I believe that the oral vocabulary measure and the synonyms items from the reading vocabulary test will be related to L2 reading comprehension. However, the multiple meaning words items and context clues items from the reading vocabulary test will likely have a stronger relationship with L2 reading comprehension because they require a significant amount of L2 reading and assess skills similar to those assessed in a reading comprehension test.

As noted previously, I posit that L1 reading comprehension will be the strongest predictor of L2 reading comprehension. I am including two measures of L1 reading comprehension in the study. One is a parallel version of the L2 (English) test of academic reading comprehension and the other is a measure of basic reading comprehension.⁷ I hypothesize that both measures of L1 reading comprehension will have a stronger relationship with L2 reading comprehension than will L2 vocabulary. And for the two separate L1 measures, I believe that the test of academic reading comprehension will account for more variance in L2 academic reading comprehension because the tests are very similar and define the construct of reading comprehension in the same way as they are parallel assessments.

The literature has discussed a threshold of L2 linguistic knowledge that a student must reach in order to draw on his or her L1 reading skills. This threshold hypothesis has

⁷ See Chapter 5 for a detailed description of these assessments.

assumed that the student has well developed L1 reading skills and has not been investigated among students who have low levels of L1 reading skills. There is evidence for the existence of a threshold among adolescents with age-appropriate literacy (Bossers, 1991; Lee & Schallert, 1997). It may be that there is also a threshold level of L2 linguistic knowledge for students with low L1 reading skills, but that once the threshold is reached, the L1 reading skills will not be as useful to students with low levels of L1 reading than to students with high levels of L1 reading. Thus, it could be the case that all L2 readers have to acquire a certain level of L2 linguistic knowledge before they can transfer or draw on their L1 reading skills. I hypothesize that there may be another threshold, not of L2 proficiency, but of L1 reading comprehension, that a student must reach in order to make use of his or her L2 knowledge. It could be the case that a certain level of L1 reading skills must be reached in order for the student to use his or her L2 linguistic skills in the task of L2 reading.

If it does turn out that L1 reading is the strongest predictor of L2 reading, then this will support the idea that in L2 reading comprehension, existing reading skills in the L1 constitute the most important factor in the acquisition of L2 reading comprehension. When an older learner has not developed their L1 reading abilities, they will have the most difficulty in learning to read in an L2. And level of L1 literacy will be the most important diagnostic for incoming ELLs, with the knowledge that those with low L1 literacy will have the most difficulty in acquiring L2 literacy, and that students will be able to transfer their L1 reading skills to the L2.

Although I hypothesize that L1 reading comprehension will play the strongest role in L2 reading comprehension in the group analyses, it is important to consider the

potential differences in the development of L2 reading comprehension among those with low versus high, or age-appropriate, levels of L1 literacy. Very little research has been done on the development of L2 reading comprehension among those with low L1 literacy, and no study has compared the development of L2 reading comprehension in students with low L1 literacy and students with age-appropriate L1 literacy. The existing research on L2 reading comprehension has included students with age-appropriate L1 literacy and has found that L2 proficiency is the strongest predictor of L2 reading comprehension; I may find the same results in a group of students with age-appropriate L1 literacy. And it may be that in the group with low L1 literacy, the level of L1 reading the student has will be the most important factor in L2 reading comprehension, as in the pilot study reported in Chapter 3.

Previous research on L2 reading comprehension has often divided the participants according to level of L2 proficiency in order to test the threshold hypothesis. If the threshold hypothesis holds, the prediction is that among those with lower levels of L2 proficiency, L1 reading will not play as strong a role in L2 reading as in those with high levels of L2 proficiency. This claim is often rephrased by claiming that L1 reading skills will not transfer to the L2 until a certain level of L2 proficiency has been reached. In students with age-appropriate L1 reading, there is evidence for the threshold hypothesis, in that it does appear that a low level of L2 proficiency can prevent a student from using all of his or her L1 reading skills, and that advanced L1 reading comprehension skills cannot be fully used until the student has a high level of L2 proficiency. However, this is not to say that L1 reading skills cannot transfer immediately to the L2, but that the higher level skills will not be used until the student has reached a high enough level of L2

proficiency in order to perform tasks in the L2 that require high level comprehension skills.

In order to test the threshold hypothesis and replicate previous research, I will compare the components of L2 reading comprehension among students with low and high levels of L2 proficiency. However, as all the participants in the current study do not have high levels of L1 reading comprehension, I hypothesize that in both students with low and high L2 proficiency, the level of L1 reading comprehension will be an equally important factor in the development of L2 reading comprehension. I hypothesize that the limited role played by L1 reading comprehension in students with low levels of L2 proficiency in previous research is due to the high levels of L1 reading comprehension that all the students have, but not due to the inability of L1 reading skills to transfer to the L2. Thus, I expect to find that among students who have both low and high levels of L1 reading that the level of L1 reading ability will be an important factor in L2 reading comprehension, regardless of level of L2 proficiency.

5. Methodology

5.1 Participants

The participants in the study were 62 Spanish-speaking English language learners attending one New York City public high school.⁸ The majority (59%) of the students were enrolled in the ninth grade at the time of the study while the remainder were enrolled in the tenth grade. Of the ninth grade students, 34 had been in the school for two months, one had been in the school for one month and one has missing data. Of the tenth grade students, all had been in the school for 14 months (minus holidays) at the time of the study. The students ranged in age from 15-20 with an average age of 17.5; 56% were age 17 and below and 44% were age 18 and above.⁹ The majority (85%) of the students are from the Dominican Republic; 7% are from Honduras, 5% are from Ecuador, and 1.5% each are from Mexico and Colombia.¹⁰

In order to control for age of arrival, amount of L2 instruction and L1 maintenance, only students enrolled in the ninth and tenth grades who are newly arrived in the United States from their native countries, having been in the United States for less than two years,¹¹ are included in the study. In order to test the role of L1 literacy on L2 reading, the participants needed to have a large range of L1 literacy. We requested students with a range of L1 academic skills from the school administrators and they selected students whom they believed had such a range of L1 academic skills. A population of students labeled in New York as ‘Students with Interrupted Formal

⁸ A total of 105 students were tested. Of these, 64 completed all of the tests. Two outliers were identified, thus bringing the total number of students included in the study to 62. For information on the outliers, see Chapter 7: Results.

⁹ The school was missing the date of birth for one of the students; thus, the age is reported for N=61.

¹⁰ The school was missing country of origin for one of the students; thus, this data is reported for N=61.

¹¹ Ideally, all the participants would be new arrivals, having been in the United States for less than 1 year. However, in order to find enough participants for the study (N=62), I have allowed for additional time in the United States.

Education' (SIFE) have low L1 literacy due to having missed years of schooling, and importantly, not due to a learning disability¹². Students labeled SIFE were selected for the low L1 literacy participants. Newly arrived ELLs who were not labeled SIFE were selected for the high L1 literacy participants. This was the initial selection criteria for participation in the study, but all students were given a test of L1 reading comprehension, which serves as a measure of level of L1 reading ability.

5.2 Measurements and Testing Procedures

The dependent variable in the present study is L2 (English) reading comprehension. The independent variables include L1 (Spanish) reading comprehension, L1 and L2 vocabulary, and L2 syntax. A measure of L1 syntax was also included in order to test the typical L1 language development of the students.¹³ I also administered a test of working memory in order to look at another known predictor of reading, separate from language skills (Cain, Oakhill, & Bryant, 2003). Including this measure will help control for cognitive factors that may account for poor reading ability.

See below for the list of all variables and the corresponding assessments:

Dependent Variable

- L2 (English) academic reading comprehension – English *Academic Language and Literacy Diagnostic (ALLD)* Reading Comprehension subtest

Predictor Variables

Linguistic skills

- L1 (Spanish) academic vocabulary
 - Oral - *Batería III* Picture Vocabulary subtest
 - Reading – Spanish *ALLD* Reading Vocabulary subtest
- L2 (English) academic vocabulary
 - Oral - *The Woodcock-Muñoz Language Survey* Picture Vocabulary subtest

¹² Previous research on SIFE by Klein and Martohardjono support this. Also, I will include a test of cognitive ability (working memory) in the study to screen for students who may have a learning difficulty.

¹³ The measure of L1 syntactic processing was originally to be included as a predictor variable, but as the results will indicate, there was very little variance in this measure. The structures tested are generally acquired during childhood, so it was not appropriate for an independent variable in the study. Thus, it was used to screen the participants for typical L1 language development.

- Reading – English *ALLD* Reading Vocabulary subtest
- L2 (English) syntactic processing – RISLUS English Syntax Test
- Reading skills
- L1 (Spanish) reading comprehension
 - Academic reading comprehension – Spanish *ALLD* Reading Comprehension subtest
 - Basic reading comprehension – Spanish *Evaluación Diagnóstica de la Comprensión Lectora (EDICOLE)*

Control Variables

- Working memory (Administered in L1 (Spanish)) - *Batería III* Reverse Number Recall subtest
- L1 (Spanish) syntactic processing – RISLUS Spanish Syntax Test

The data collection took place in three sessions. The first session involved the group-administered L1 measures (i.e. Spanish *ALLD* Reading Vocabulary and Academic Reading Comprehension, *EDICOLE* Basic Reading Comprehension, and RISLUS Spanish Syntax Test). The second session involved the group-administered L2 measures (i.e. English *ALLD* Reading Vocabulary and Academic Reading Comprehension, and RISLUS English Syntax test). The third session involved the individually-administered assessments (i.e. Oral Vocabulary and Working Memory). Students were given the individually-administered L1 measures and L2 measures by two different researchers, with some students receiving the L1 measures first and others receiving the L2 measures first.

5.2.1 Academic Reading Comprehension Measures (L1 and L2)

For the L1 and L2 reading comprehension measures, I administered the *Academic Language and Literacy Diagnostic (ALLD)*, a test that was developed by RISLUS in conjunction with Pearson publishers and the New York City Department of Education. The English ALLD was adapted from the *Stanford Achievement Test, Tenth Edition* and the Spanish ALLD was adapted from the *Aprenda 3: La prueba de logros en español, Tercera edición*. The assessments focus on the reading comprehension skills that are

necessary to succeed academically in U.S. schools. The test was designed for high school immigrant students in New York City, and is a cumulative assessment that includes passages and test items from the following grade levels: second through seventh, ninth and eleventh. There are a total of 38 items in both the English and Spanish versions, with three items from second grade level, four items from third grade level, six items from fourth grade level and five items each in fifth through seventh, ninth and eleventh grade levels.

The test format follows that of typical academic standardized reading comprehension tasks, with passages followed by multiple-choice questions. The students read a passage, and then answer multiple-choice questions about the passage. The passages are either informational or functional; informational passages are non-fiction (e.g. a story on mosquitoes) and functional passages convey information encountered in everyday life (e.g. a newspaper ad for employment). The questions assess basic understanding and higher-level thinking skills such as critical analysis, strategies, and interpretation. The majority of items test higher-level skills, with the English version having 29 thinking skills items and nine basic understanding items and the Spanish version having 30 thinking skills items and eight basic understanding items.

As L2 academic reading comprehension is the dependent variable, and this is the type of skill that students must succeed on in high school, the *ALLD* will be the primary measure of reading comprehension in the study. However, I am including another measure of L1 reading comprehension with the goal of getting a clearer picture of the students' L1 reading abilities and their relationship to the students' L2 reading comprehension.

5.2.2 Basic Reading Comprehension Measure (L1)

Research has suggested that tests of reading comprehension have differing relationships between one another and between various predictor variables. For example, Cutting and Scarborough (2006) found that the relative contribution of decoding and oral language skills to reading comprehension varied depending on the test of reading comprehension used. Thus, in order to get a more complete picture of the participants' L1 reading ability, two measures of L1 reading comprehension will be administered.

For the additional L1 reading comprehension measure, the *Evaluación Diagnóstica de la Comprensión Lectora (EDICOLE)* was administered in addition to the *ALLD*. The *EDICOLE* is a novel reading comprehension test designed by the Center for Applied Linguistics¹⁴. The test was developed to assess comprehension, including the skills of text memory, text inferencing, background knowledge, and the ability to integrate background knowledge with text information. The aim in developing the test was to minimize the impact of decoding skills, vocabulary, and linguistic sophistication by using simple vocabulary, simple syntactic structures, and providing more context by embedding relational propositions in the narrative. The passages in the *EDICOLE* use “simple, regular, high-frequency words” and minimize “the impact of background knowledge...by limiting topics to very familiar ones and by introducing nonce words for novel concepts” (Francis, Snow et al., 2006, p. 304).

The *EDICOLE* consists of three passages each followed by 18 questions, for a total of 54 questions. Each passage is followed by two items in the format of a question (e.g. ‘Which animal has hair?’). The student is given three choices, one of which is ‘I

¹⁴ There is an English version of this assessment, the *Diagnostic Assessment of Reading Comprehension (DARC)*. The description of the *EDICOLE* is taken from the description of the *DARC*, as there is more information describing the English version of the assessment.

don't know.' The remaining sixteen items following each passage are in the format of a true/false question; the student reads a statement (e.g. 'Ana's animals like to play in the living room.') and must choose 'yes,' 'no,' or 'I don't know.'

5.2.3 Reading Vocabulary Measures (L1 and L2)

The reading vocabulary assessment was taken from the *ALLD* and includes items from the following grade levels: third through seventh, ninth and eleventh. There are a total of 39 vocabulary items, with grade levels three, four and six each having five items and grade levels five, seven, nine and eleven each having six items.

This assessment is multiple-choice and is composed of three sections: synonyms, multiple meaning words, and context clues. The synonyms section requires a student to choose a synonym for a printed word. There are a total of twelve synonyms items. The multiple meaning words section provides a target sentence with a target word underlined, and four subsequent sentences all containing the target word used in four different ways. The student must select the sentence in which the word is used in the same way as in the target sentence. There are a total of thirteen multiple meaning words items. The context clues section provides a target sentence with an underlined word; the target sentence provides a clue to the meaning of the underlined word. The student must choose the meaning of the underlined word. There are a total of fourteen context clues items.

In addition to administering a measure of reading vocabulary, a measure of oral vocabulary was included in order to see the difference between oral and reading vocabulary and their contribution to L2 reading comprehension. I hypothesize that reading vocabulary will be more closely related to reading comprehension than oral

vocabulary because reading vocabulary involves some of the skills that are also part of reading comprehension.

5.2.4 Oral Vocabulary Measures (L1 and L2)

The measure of English oral vocabulary was taken from the English version of *The Woodcock-Muñoz Language Survey*, which is an English test designed to measure the language proficiency of non-native speakers of English. Spanish oral vocabulary was measured with a subtest of the *Batería III*, which is a Spanish assessment designed for native speakers. These tests are both published by Riverside Publishing and have a parallel subtest in English and Spanish called Picture Vocabulary. Both tests are cumulative in nature, and are appropriate for ages two through ninety; they are scored based on age and grade norms. The Picture Vocabulary subtest is administered individually. The student is shown a series of pictures and is asked to name the pictures. The vocabulary begins with simple, everyday vocabulary, such as ‘baby’ and progressively becomes more difficult and academic in nature, with the final word on the English test being ‘mortise.’ The student stops taking the test once he or she answers six consecutive items incorrectly.

5.2.5 Measure of Syntactic Processing (L1 and L2)

The assessment of syntactic processing was developed by the Research Institute for the Study of Language in Urban Society (RISLUS) and tests the comprehension of complex syntactic structures through listening comprehension. The assessment has an English version and a Spanish version. This assessment of syntactic processing is designed to evaluate acquisition of sentence structure independently from vocabulary. Therefore, the sentences use very simple vocabulary. The test was administered in a

group setting and is composed of 44 items. Each student has a test booklet with each item on a separate page. The student sees three pictures for each item. The test administrator says a sentence for each item and repeats the sentence once. The student is then asked to choose the picture that corresponds to the sentence. The structures tested are coordination, relative (or adjective) clauses, temporal adverbial clauses, and subjectless subordinate clauses. See examples of each structure below:

- a) Subject coordination: The bear and the dog chase the cat.
- b) Relative clause: The bear who touches the dog dances.
- c) Temporal adverbial clauses: After jumping, the dog kicks the cat.
- d) Subjectless subordinate clauses: The dog tells the bear to sit, and he does.

5.2.6 Working Memory Measure

In order to determine the working memory of the students, the subtest of Reverse Number Recall from the *Bateria III* was administered in Spanish. This test is cumulative in nature, and is appropriate for ages two through ninety; it is scored based on age and grade norms. This is an individually-administered test in which the test administrator says a series of numbers to the student and the student must then repeat the numbers in the reverse order. For example, a student would hear the administrator say ‘5, 9’ and the student must then say ‘9, 5.’ The test gets progressively more difficult, starting with five items of two numbers, then five items of three numbers, and then four items each for items with four to eight numbers. The test is stopped once the student answers the last three items in a given group incorrectly, with the items grouped by the number of numbers in the items.

I administered this task because low literacy skills could, in principle, be explained by a poor working memory. This test allows us to control for such general problems, and attribute any low literacy findings to factors unrelated to general cognitive development.

5.3 Data Analysis

5.3.1 Descriptives

First descriptive statistics were calculated in order to verify that all of the variables had a range of scores with an even distribution and to identify any outliers that could affect the results. See below for details on how each measure was scored.

The *ALLD* results, including L1 and L2 academic reading comprehension and reading vocabulary, are reported in terms of grade level and total percent correct. The percent correct is used in the analyses, as this is a continuous variable that will show the range of scores on the reading comprehension measures. I will also look at the subskills tested in the reading vocabulary measures, looking at the performance of the students on synonyms, multiple meaning words and context clues items. These subskills are scored as percent correct and not by grade level, as the *ALLD* reading vocabulary grade level is determined by looking at a combination of all of the subskills. The *EDICOLE* results are reported in terms of total percent correct, as are the results from the tests of syntactic processing. The measures of oral vocabulary, both in English and Spanish, are reported as percent correct, looking at the total number of items correct out of the entire test. Note that the administration of the test is discontinued once the student answers six consecutive items incorrectly. However, in order to get a score comparable across all participants to use in the analyses, I will use percent correct.

The Reverse Number Recall test of working memory from the *Batería III* is accompanied with scoring software that produces a score report for each student, indicating their level of working memory based on age and grade norms. These results will be used as a control, in order to ensure that all the participants are in the normal range of working memory for their age.

5.3.2 Correlations

Correlation analyses using SPSS were done in order to determine the relationships among the variables.

5.3.3 Multiple Regression

Finally, the data were analyzed using multiple regression in order to look at the relative contribution of the predictor variables on L2 reading comprehension. In order to address the main research question and look at the relative contribution of all of the predictor variables on L2 reading comprehension, a hierarchical regression was run. The predictor variables were entered into the regression in the order predicted by my pilot study, hypotheses and previous research; L1 academic reading comprehension was entered first, followed by L2 reading vocabulary, L2 syntactic processing, and L1 reading vocabulary. I did not include both measures of L1 reading comprehension in the same regression as they are two measures of the same variable in this study. I reran the same hierarchical regression with L1 basic reading comprehension in place of L1 academic reading comprehension in order to see if the relationship between the variables remained the same when using two different tests of L1 reading comprehension.

Additional regressions were run to address the other research questions. A hierarchical regression was run with only the L2 variables in order to look at the relative

contribution of L2 reading vocabulary and syntax on L2 reading comprehension. Based on previous research, the results from my pilot study, and my hypotheses, L2 reading vocabulary was entered first, followed by L2 syntactic processing.

In order to look at the subskills of the L2 reading vocabulary test and the roles they play in L2 academic reading comprehension, I ran a separate stepwise regression with the three subskills as the independent variables and L2 academic reading comprehension as the dependent variable. I did a stepwise regression as this analysis was exploratory; previous research has not specifically addressed the relative importance of these three types of vocabulary knowledge on L2 reading comprehension.

Finally, an additional regression was run in order to address the question involving the threshold hypothesis and whether or not the role of L1 reading comprehension depends on the level of L2 vocabulary or whether or not the role of L2 vocabulary changes based on the level of L1 reading comprehension. A stepwise regression in which the dependent variable was L2 academic reading comprehension and the predictor variables included L1 academic reading comprehension, L2 reading vocabulary, and an interaction term calculated by multiplying L1 academic reading comprehension and L2 reading vocabulary was done. The variables were all centered around the mean before performing the analysis; when performing a regression looking for the presence of an interaction, the variables should be centered in order to reduce the multicollinearity of the interaction with the predictor variables and to aid in the interpretation of the results.

First all the regression analyses were done with the percent correct scores. Then, in order to control for the variance of the residuals, regressions using the arcsin

transformation were done. The arcsin transformation stabilizes the variance of the residuals for the variables involved in the analysis. This is important when the variables in an analysis are proportions, as the variance may differ and will not meet the assumption of regression analysis that there is equal variance among the residuals of the variables involved in the analysis. In a regression analysis, values are fit along a regression line, and having unequal variances could lead to an incorrect line to fit the data. Thus, the arcsin transformation was done in order to help ensure accurate regression results.

6. Results

A total of 105 students were tested as part of the study, but only 64 completed all of the group-administered assessments. See Table 6.1 for the list of assessments and the number of students who completed each one.

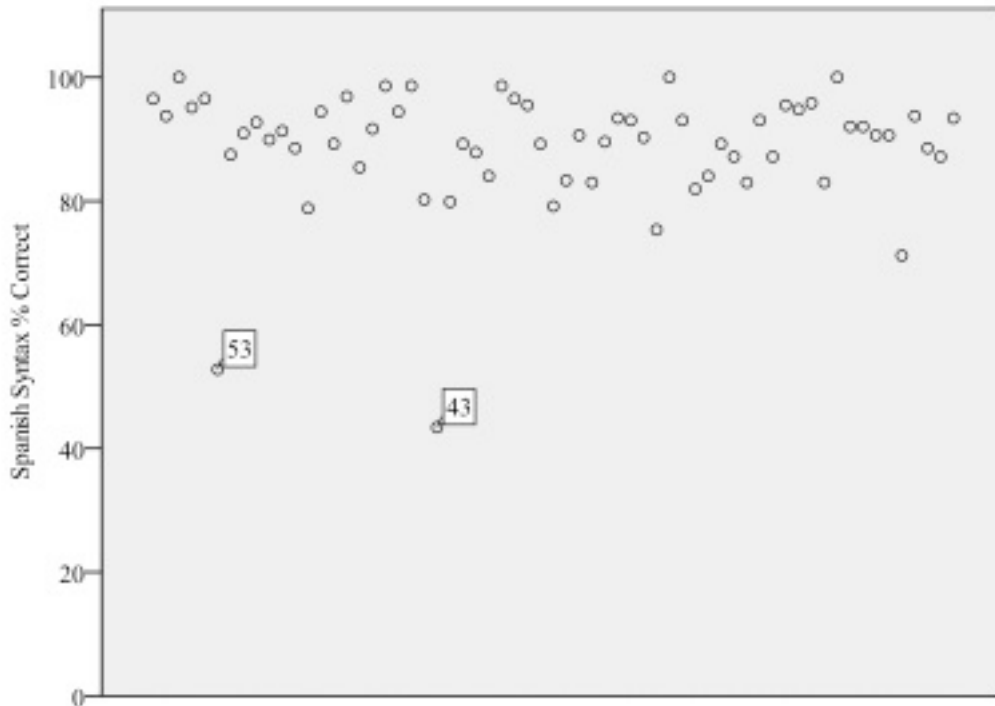
Table 6.1: Number of Students who Completed Each Assessment

Group-Administered Assessments	Number of Students who Completed Assessment
English <i>ALLD</i> Academic Reading Comprehension	94
English <i>ALLD</i> Reading Vocabulary	89
English RISLUS Syntax Test	91
Spanish <i>ALLD</i> Academic Reading Comprehension	102
Spanish <i>ALLD</i> Reading Vocabulary	94
Spanish <i>EDICOLE</i> Basic Reading Comprehension	92
Spanish RISLUS Syntax Test	103
Individually-Administered Assessments	Number of Students who Completed Assessment
<i>Bateria III</i> Working Memory	41
<i>Bateria III</i> Spanish Picture Vocabulary	41
<i>Woodcock-Muñoz</i> English Picture Vocabulary	43

Although a large number of students completed each group-administered assessment, the number of students who completed all of the group-administered assessments was only 64. The number of students who completed the individually-administered assessments in addition to all of the group assessments was 25 for the oral vocabulary measures and 24 for the test of working memory.

The results from all tests were examined in order to identify any outliers. Two outliers were identified based on the scores of the Spanish RISLUS Syntax Test and are excluded from the analyses, bringing the total number of participants to 62. No students with potential language delays should be included in the study, as their development of reading may be different from more typically-developed adolescents. Figure 6.1 is a scatterplot showing the scores of the students on the test of Spanish syntactic processing; the two outliers are labeled with their scores on the syntax test, scoring 43% and 53% correct. These two students scored well below their peers on L1 syntactic processing and were thus excluded from the analyses.

Figure 6.1: % Correct on Spanish Syntactic Processing, with Outliers Labeled



The two outliers scored at the 2nd grade level on the Spanish *ALLD* Academic Reading Comprehension measure and scored 31% and 35% correct on the Spanish *EDICOLE* assessment of basic reading comprehension. These students did not show high

levels of L1 reading, and we do not want to include them in the analyses in case their low levels of L1 reading are due to factors such as language delays, and not poor educational backgrounds with little opportunity to develop L1 reading skills.

The number of participants included in the majority of the analyses is 62. A subset of the students completed the individually-administered assessments.¹⁵ The results of the individually-administered tests will also be reported (N=22-25).

6.1 Results for the group-administered assessments (N=62)

6.1.1 Descriptives

See Tables 6.2 and 6.3 for the descriptive statistics for the group-administered assessments. Table 6.2 shows the results from the Spanish assessments and Table 6.3 shows the results from the English assessments.

Table 6.2: Mean percent (SD) and grade level (SD) for the Spanish group-administered assessments (N=62)

	Spanish Basic RC (<i>EDICOLE</i>)	Spanish Academic RC (<i>ALLD</i>)	Spanish Vocabulary (<i>ALLD</i>)	Spanish Syntactic Processing
Mean (SD)	67% (13%)	52% (15%)	62% (17%)	90% (6%)
Grade Level (SD)	--	5.8 (2.5)	7.7 (2.8)	--

Table 6.3: Mean percent (SD) and grade level (SD) for the English group-administered assessments (N=62)

	English Academic RC (<i>ALLD</i>)	English Vocabulary (<i>ALLD</i>)	English Syntactic Processing
Mean (SD)	35% (12%)	38% (16%)	77% (15%)
Grade Level (SD)	3.1 (1.9)	4 (2.2)	--

¹⁵ The school was only able to allow access to the students for individual testing on two school days, and we were unable to test all students during this time.

Recall that the *ALLD* in both Spanish and English is a cumulative assessment that includes test items from the second grade level (in the case of academic reading comprehension) or the third grade level (in the case of reading vocabulary) up to the eleventh grade level. Thus, the results from the *ALLD* are reported not only as mean percent correct, but also as average grade level. Note that the standard deviations for all variables except Spanish syntactic processing range from 12% to 16%, indicating that the population tested here does have a range of skills in both their L1 and L2.

The *ALLD* reading vocabulary test is composed of three sections. See Table 6.4 for the descriptive statistics for these three sections of the English *ALLD* reading vocabulary assessment. The *ALLD* grade level score is computed based on the combined score of these three subskills; thus, the results for the subsections of the reading vocabulary test are not reported as grade level scores but only as mean percent correct.

Table 6.4: Mean percent correct (SD) for English *ALLD* Reading Vocabulary Subskills (N=62)

	Synonyms	Multiple meaning words	Context clues
Mean (SD)	34% (20%)	39% (19%)	45% (20%)

As a group, the students evidenced the most difficulty with the synonyms section and performed best on the context clues items. This suggests that the students do not have a breadth of vocabulary knowledge, but were able to use the text provided in the context clues items to guess the meaning of unknown words.

I will now report on the correlations among the predictor variables and the dependent variable.

6.1.2 Correlations

Table 6.5 shows the correlations between the dependent and group-administered independent variables.

Table 6.5: Correlation matrix (N=62)

	1.	2.	3.	4.	5.	6.
1. English Academic Reading Comprehension (<i>ALLD</i>)	--					
2. Spanish Basic Reading Comprehension (<i>EDICOLE</i>)	.450***	--				
3. Spanish Academic Reading Comprehension (<i>ALLD</i>)	.571***	.483***	--			
4. Spanish Reading Vocabulary (<i>ALLD</i>)	.369**	.602***	.420**	--		
5. English Reading Vocabulary (<i>ALLD</i>)	.435***	.305*	.370**	.471***	--	
6. English Syntax	.397**	.472***	.414**	.565***	.386**	--

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

Note that all the correlations are significant. We expect to see a relationship between all of the variables, as the same skills are being assessed in two languages and they are all related to reading. However, the main research questions will be addressed using regression analyses in order to look at the relative importance of the predictor variables on L2 reading comprehension, as well as other relationships that are present between the variables which are addressed in the more detailed research questions. And although the variables are all correlated, multicollinearity does not appear to be a problem as there are no bivariate correlations greater than .602, the correlation between Spanish reading comprehension and Spanish reading vocabulary.

6.1.3 Regression Results

A number of regression analyses were run in order to address the research questions dealing with the most important components involved in L2 academic reading comprehension among adolescent learners. I will report on results from regressions using the proportion correct values for all variables. However, to help ensure that the assumptions for regression analyses are met, additional regressions were run using the arcsin-transformed values of the proportions correct for the outcome and predictor variables. In all cases, the end results are the same for both types of analyses. The results are organized by research question and are reported below.

6.1.3.1 Main Research Question: Do reading skills in the L1 or language skills in the L1 or L2 play a stronger role in L2 reading comprehension?

The overarching research question is whether reading skills in the L1 or language skills in the L1 and L2 are the more important predictors of L2 reading comprehension. In order to address this question, I did a hierarchical multiple regression analysis in which L2 academic reading comprehension was the dependent variable and the predictor variables included L1 academic reading comprehension, L2 vocabulary and syntax, and L1 vocabulary. I entered the predictor variables into the model in the following order, based on my pilot study, hypotheses, and the literature on L2 reading comprehension: L1 Academic Reading Comprehension, L2 Reading Vocabulary, L2 Syntax, L1 Reading Vocabulary. See Table 6.6 for the results from this analysis.¹⁶

¹⁶ In reporting the results from the regression analyses, I will only include significant results in the tables.

Table 6.6: Regression Analysis with L2 Academic Reading Comprehension as Dependent Variable, Including Predictor Variables of L1 Academic Reading Comprehension, L2 Reading Vocabulary, L2 Syntax, L1 Reading Vocabulary (N=62)

	B	SE B	B
Step 1			
L1 Academic Reading Comprehension	.47	.09	.57***
Step 2			
L1 Academic Reading Comprehension	.39	.09	.48***
L2 Reading Vocabulary	.20	.08	.26*

Note: $R^2 = .33$ for Step 1, $\Delta R^2 = .06$ ($p < .05$) for Step 2.

*** $p < .001$; * $p < .05$

From these results, it appears that L1 academic reading comprehension is the strongest contributor to L2 academic reading comprehension, above that of L2 reading vocabulary, although L2 reading vocabulary is also a significant contributor to L2 academic reading comprehension. The unique contribution of these two variables to L2 academic reading was calculated by squaring the semipartial (part) correlation. L1 academic reading comprehension accounted for 20% of the variance in L2 academic reading comprehension and L2 reading vocabulary accounted for 6% of the variance.

6.1.3.2 Research Question: Does the role of L1 reading comprehension differ when two different measures of L1 reading comprehension are used?

I ran another similar regression, this time including the measure of L1 basic reading comprehension. Looking at another test of L1 reading comprehension and its relative importance to L2 reading comprehension will give us more information as to the relative importance of reading skills developed in the L1 and language skills in both the L1 and L2. See Table 6.7 for the results from this analysis.

Table 6.7: Regression Analysis with L2 Academic Reading Comprehension as Dependent Variable, Including Predictor Variables of L1 Basic Reading Comprehension (*EDICOLE*), L2 Reading Vocabulary, L2 Syntax, L1 Reading Vocabulary (N=62)

	B	SE B	B
Step 1			
L1 Basic Reading Comprehension	.44	.11	.45***
Step 2			
L1 Basic Reading Comprehension	.34	.11	.35**
L2 Reading Vocabulary	.25	.09	.33**

Note: $R^2 = .20$ for Step 1, $\Delta R^2 = .10$ ($p < .01$) for Step 2.

*** $p < .001$; ** $p < .01$

Again, we see that L1 reading comprehension is the strongest contributor to L2 reading comprehension. Thus, with two different measures of L1 reading comprehension, we find that the students' level of L1 reading ability is a stronger predictor of L2 reading ability than the students' level of L2 vocabulary. Again, in order to determine the unique contribution of L1 reading comprehension and L2 vocabulary to L2 reading comprehension in this model, I squared the semipartial correlations. L1 reading comprehension accounts for 11% of the variance in L2 reading comprehension and L2 vocabulary accounts for 10% of the variance in L2 reading comprehension. Note that the relative importance of the two is now closer. Notably, L2 syntax and L1 reading vocabulary are not significant predictors of L2 reading comprehension in these regression models.¹⁷

The relationship between L1 reading vocabulary and L2 reading comprehension is likely not seen in the regression results because L1 vocabulary is related to L2 reading through L1 reading. In order to test this hypothesis and look more closely at the role of L1 vocabulary in L2 reading, I ran a hierarchical regression in which L1 vocabulary was

¹⁷ Although they were not found to be significant, L2 syntax approached significance in both models.

entered into the model before L1 reading comprehension. See Table 6.8 for the results from this regression.

Table 6.8: Regression Analysis with L2 Academic Reading Comprehension as Dependent Variable, Including Predictor Variables of L1 Reading Vocabulary and L1 Academic Reading Comprehension (N=62)

	B	SE B	B
Step 1			
L1 Reading Vocabulary	.26	.09	.37**
Step 2			
L1 Reading Vocabulary	.11	.08	.16 ^{ns}
L1 Reading Comprehension	.41	.09	.51***

Note: $R^2 = .14$ for Step 1, $\Delta R^2 = .21$ ($p < .001$) for Step 2.

*** $p < .001$; ** $p < .01$

These results suggest that L1 reading vocabulary is related to L2 reading comprehension indirectly through L1 reading comprehension. When not factoring in performance on L1 reading comprehension, L1 reading vocabulary is significantly related to L2 reading comprehension. However, this significant relationship disappears when L1 reading comprehension is included in the regression. In the previous regression analyses, the relationship between L1 reading vocabulary and L2 reading comprehension was not seen because the variance explained by L1 reading comprehension includes the effect of L1 reading vocabulary.

6.1.3.3 Research Question: Within the L2, does syntax or vocabulary have a stronger relationship with L2 reading comprehension?

Although L2 syntax was not a significant predictor in the first two regression models, including fewer predictor variables in the regression may allow us to see the role played by L2 syntax in L2 reading comprehension. In order to address the question dealing with the role of L2 language skills in L2 reading comprehension and the relative

importance of L2 vocabulary and syntax, I ran a separate regression in which only the L2 variables were included. See Table 6.9 for these results.

Table 6.9: Regression Analysis with L2 Academic Reading Comprehension as Dependent Variable, Including Predictor Variables of L2 Reading Vocabulary and L2 Syntax (N=62)

	B	SE B	B
Step 1			
L2 Reading Vocabulary	.33	.09	.44***
Step 2			
L2 Reading Vocabulary	.25	.09	.33**
L2 Syntax	.22	.10	.27*

Note: $R^2 = .19$ for Step 1, $\Delta R^2 = .06$ ($p < .05$) for Step 2.

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

Although the original model did not find a significant role for L2 syntax in L2 reading, when we only include the L2 variables, we find that L2 syntax does play a significant role in L2 reading comprehension. In order to look at the unique contribution made by these two variables to L2 reading comprehension, the semipartial correlations were squared. L2 vocabulary was found to account for 9% of the variance in the model and L2 syntax accounts for 6% of the variance in the model. These results match much of the research on L2 reading comprehension that has found a stronger role for L2 vocabulary in L2 reading comprehension than for L2 syntax.

6.1.3.4 Research Question: Does the relative importance of L2 academic vocabulary in L2 reading comprehension lessen when only including vocabulary items that don't require significant amounts of reading?

I will now report on a stepwise multiple regression analysis including the subskills of the L2 Reading Vocabulary measure in order to look more closely at the role of L2 vocabulary in L2 reading. The three subskills in the ALLD Reading Vocabulary test are synonyms, multiple meaning words, and context clues. The synonyms items

require the least amount of reading in that the student must only read words and pick a synonym for a target word. The context clues items require more reading, with the student having to read a target sentence and pick a synonym for the underlined word in the target sentence. Finally, the multiple meaning words items require the most reading, each involving five sentences, each with the same word used in different ways. See Table 6.10 for the results.

Table 6.10: Stepwise Regression Analysis with L2 Academic Reading Comprehension as Dependent Variable, Including Predictor Variables of L2 Reading Vocabulary Subskills of Synonyms, Multiple Meaning Words and Context Clues (N=62)

	B	SE B	B
Step 1			
L2 Multiple Meaning Words	.26	.08	.41**

Note: $R^2 = .17$ for Step 1.

** $p < .01$

The only significant contributor to L2 academic reading comprehension was the multiple meaning words subskill of the L2 reading vocabulary measure. The subskills of context clues and synonyms were not significant predictors of L2 academic reading comprehension.

6.1.3.5 Research Question: Is there an interaction between L1 reading comprehension and L2 vocabulary in predicting L2 reading comprehension?

In order to test the threshold hypothesis and to determine if the importance of L1 reading comprehension is contingent on the level of L2 language proficiency or if the importance of L2 language proficiency relies on the level of L1 reading comprehension in L2 reading comprehension, I did an additional regression analysis with the inclusion of an interaction term. This analysis is calculated by using the product of the two predictor variables as an additional predictor of L2 reading comprehension. It will indicate whether or not there is an interaction between the two predictors—that is, whether or not the

effect that one predictor has on the dependent variable depends upon the value of the other predictor. In the analysis, I centered the variables around their means in order to reduce any multicollinearity of the interaction and to aid in the interpretation of the results. The interaction term was not significant in the regression model, both when the regression was done hierarchically and when done as a stepwise regression, forcing the predictors and their interaction into the model. The results match those in the regressions reported for the first research question in Table 6.6. Thus, we do not find evidence for the value of either L1 reading comprehension or L2 vocabulary depending on the other for its role in L2 reading comprehension.

6.1.3.6 Research question: Will the components of L2 reading comprehension play different roles in those with low versus high levels of L1 literacy?

The previous research on L2 reading comprehension among adolescents has focused only on students with high levels of L1 reading comprehension, and no study has directly compared good L1 readers with poor L1 readers. Students with low versus high levels of L1 reading comprehension were analyzed separately in order to see if the relative importance of the predictors of L2 reading comprehension were the same or different among these students.

The students were split based on their level of L1 reading comprehension into a low performing group (N=18) and a high performing group (N=22). The low performing group scored at or below the fourth grade level in Spanish academic reading comprehension; the high performing group scored at or above the seventh grade level in Spanish academic reading comprehension, as measured by the *ALLD*. An independent samples t-test was performed in order to confirm that these two groups were significantly different from one another. The low group did score significantly lower on L1 reading

comprehension than the high group ($t(38) = 9.5, p < .001$). Students who scored at the 5th and 6th grade levels were omitted from this analysis, as they did not score on the very low end or the very high end on L1 reading comprehension, and the aim of this analysis is to compare poor L1 readers with good L1 readers, with the two groups differing significantly in their L1 reading ability.

In a stepwise regression analysis with L2 academic reading comprehension as the dependent variable, the predictor variables of L1 academic reading comprehension, L2 reading vocabulary and L2 syntax were entered into the model. I repeated this analysis for the two groups of students.

Among the good L1 readers, L2 vocabulary was the only significant predictor of L2 reading comprehension, $\beta = .50, t(20) = 2.60, p < .05$, accounting for about 25% of the variance, $R^2 = .25, F(1, 20) = 6.75, p < .05$. This is an important finding in that it matches the previous research that has found L2 vocabulary to be the strongest predictor of L2 reading comprehension among good L1 readers.

The poor L1 readers evidenced L2 syntax as being the only significant factor in the development of L2 reading comprehension ($\beta = .48, t(16) = 2.20, p < .05$, accounting for about 22% of the variance, $R^2 = .22, F(1, 16) = 4.82, p < .05$). This is an interesting finding that matches research on the importance of syntactic processing in the development of reading comprehension, and coincides with the notion that until processing becomes automatic, a student will not be able to be a successful reader. The students with poor L1 reading comprehension had significantly lower scores on L2 syntactic processing than did the students with good L1 reading comprehension ($t(27.32) = 2.14, p < .05$).

6.1.3.7 Research question: Will the components of L2 reading comprehension play different roles in those with low versus high levels of L2 proficiency?

In order to test the threshold hypothesis, as in other studies on L2 reading comprehension among adolescents, I split the students into a low and high L2 proficiency group based on their scores on the measure of L2 vocabulary. The participants in the study are concentrated at the low end of L2 proficiency; thus, the sizes of the two groups are very unequal. The low group (N = 49) scored at the third grade level or below on L2 vocabulary, while the high group (N = 13) scored at the fifth grade level or above on L2 vocabulary. In a stepwise regression analysis with L2 academic reading comprehension as the dependent variable, I entered the predictor variables of L1 academic reading comprehension, L2 reading vocabulary and L2 syntax. I repeated this analysis for the two groups of students. Both groups evidenced L1 reading comprehension as the strongest predictor of L2 reading comprehension, suggesting that regardless of L2 proficiency level, L1 reading is the most important factor in L2 reading.

These findings, combined with the results from the main analyses, suggest that overall L1 reading comprehension is the most important factor in L2 reading comprehension, but for students with different levels of reading comprehension, there are differences in the most important contributors to L2 reading comprehension. Specifically, it appears that in poor readers, level of L2 syntactic processing is more important than level of L2 vocabulary, whereas in good readers, level of L2 vocabulary is more important than level of L2 syntactic processing. Likely this is due to the good readers having more automated processing of complex sentences, while the poor readers struggle with the processing of complex sentences.

6.2 Results for the individually-administered assessments

A subset of the 62 students included in the analyses thus far completed three individual assessments – a test of working memory and an oral vocabulary test in both Spanish and English. The test of working memory was administered as a control variable with the purpose of ensuring that the participants in the study with low L1 reading skills had low levels of L1 reading comprehension due to lack of instruction and opportunity to learn rather than due to a cognitive reading difficulty. The oral vocabulary tests were given in order to further explore the role of vocabulary in reading, looking not only at reading vocabulary but also at oral vocabulary.

6.2.1 Descriptives

The test of working memory was that of Reverse Number Recall, taken from the *Batería III*. The test was given in Spanish to 24 out of the 62 students who were included in the analyses reported above. The results were calculated using the scoring software provided by the test publisher. Of the 24 students tested, based on their age, 18 scored below average, 3 scored low average, and 3 scored average. In order to look more closely at these unexpected results, with three fourths of the students having very low working memory, these students' scores on Spanish academic reading comprehension and on Spanish syntax were examined. We thought it unlikely that 75% of the students tested had cognitive difficulties, and wanted to explore the students' performance on other L1 measures. See Table 6.11 for the students' scores on the test of working memory in addition to two of the Spanish assessments, sorted by level of working memory.

Table 6.11: Scores for 24 Students on Working Memory, Spanish Academic Reading Comprehension, and Spanish Syntax (Sorted by Working Memory Score)

	Working Memory Score	Grade Level Score on Spanish Academic Reading Comprehension	% Correct on Spanish Syntax
1	Below average	3	83%
2	Below average	2	93%
3	Below average	9	97%
4	Below average	7	94%
5	Below average	9	88%
6	Below average	9	84%
7	Below average	2	94%
8	Below average	7	93%
9	Below average	5	89%
10	Below average	5	87%
11	Below average	5	96%
12	Below average	2	92%
13	Below average	7	80%
14	Below average	11	89%
15	Below average	9	90%
16	Below average	2	100%
17	Below average	2	92%
18	Below average	7	92%
19	Low average	5	79%
20	Low average	11	99%
21	Low average	4	94%
22	Average	7	97%
23	Average	9	90%
24	Average	11	99%

It does not appear that the level of working memory is related to the student’s level of L1 reading ability – both students with high L1 reading and those with low L1 reading scored below average on the test of working memory, and both students with high L1 reading and low L1 reading scored in the average range. Furthermore, all the students performed well on the test of L1 syntactic processing.

The poor performance on the test of working memory is not too surprising when considering the testing conditions for the individually-administered assessments. As there was a limited amount of time to administer the individual assessments, the testing was

rushed and was held in less than optimal settings, with up to three sets of researchers and students doing the individual tests in one classroom. Some of the testing was also done in the school’s main office, with many distractions. Thus, the students were not in a setting that allowed them to concentrate in order to perform well (or to accurately indicate their level of working memory) on the test of working memory. We thus conclude that the results from this test are not valid. Notably the testing conditions for the group-administered tests did not have similar problems. The group-administered tests were given to a group of students in a classroom setting during normal class time. Therefore, the results from the group-administered tests, including the control measure of L1 syntax, are arguably more valid and reliable than the individually-administered tests.

An oral vocabulary test was also given to a subset of the students. A Spanish version and an English version of the Picture Vocabulary test were administered. Although the testing conditions were again not ideal, I will still look at the results from the tests of oral vocabulary. See Table 6.12 for the results from the Picture Vocabulary tests measuring Spanish and English oral vocabulary.

Table 6.12: Descriptives for Oral Vocabulary in Spanish (N=25) and English (N=25)

	Spanish Oral Vocabulary	English Oral Vocabulary
Mean (SD)	71% (8%)	19% (11%)
Grade Level (SD)	6.5 (2.5)	K --

The tests of Oral Vocabulary are taken from the *Bateria III* and *The Woodcock-Muñoz Language Survey*. These tests are accompanied by scoring software that reports the grade level achieved by each student. Thus, the results for oral vocabulary are

reported both in terms of percent correct and grade level. According to the score report, all of the students scored at or below the Kindergarten level on the English test of Picture Vocabulary. The students scored on average between the sixth and seventh grade levels on the Spanish test of Picture Vocabulary. These scores reflect the relative difficulty of this test of vocabulary as compared to that of the *ALLD*. On the English Picture Vocabulary test a student must answer 26 items correctly to reach the first grade level, or score 44% correct on the test.

6.2.2 Correlations

In order to look at the relationship between oral vocabulary and reading, I ran correlations looking at the relationship between these variables in both Spanish and English; 22 students completed the oral vocabulary test in both Spanish and English. See Table 6.13 for the correlation results.

Table 6.13: Correlations between reading and oral vocabulary in Spanish and English

	1.	2.	3.	4.
1. English ALLD Reading Comprehension	--			
2. English Oral Vocabulary	.510**	--		
3. Spanish ALLD Reading Comprehension	.613***	.206	--	
4. Spanish Oral Vocabulary	.403*	.440*	.199	--

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

As predicted, oral vocabulary in English and Spanish are related to reading comprehension in English. However, Spanish oral vocabulary is not related to Spanish reading comprehension, which was not an expected result. Research has consistently

shown the relationship between academic vocabulary and academic reading comprehension in a given language. Thus, this result suggests that we should interpret the results of the oral vocabulary tests with caution, just as we did the results from the working memory assessment, due to the poor testing conditions. The individual assessments were not administered in a proper environment, and thus they are likely not valid measures.

6.3 Results based on demographic data

The participants in the study differed in terms of many demographic factors, including: country of origin, length of time enrolled in school in the United States, age, and whether or not the student is labeled SIFE. In order to determine if any of these factors played a role in a model of L2 reading comprehension, I conducted regression analyses with L2 academic reading comprehension as the dependent variable and the demographic variables as the predictors. None of the predictors was significant. This finding is not especially surprising. The majority of the students are from the Dominican Republic (85%), and all other countries of origin are in South America. The limited number of students from any country other than the Dominican Republic makes it difficult to look at the effect of country of origin. And as all the students had been enrolled in U.S. schools for at most one year, the length of time in U.S. schools also did not play a role in L2 reading comprehension. The age of the students also was not a factor in how well they read in the L2.

Finally, the SIFE status of the students was not relevant to the L2 reading comprehension scores of the students. This result may at first seem counterintuitive, as the students' L1 academic skills have been shown to play an important role in L2 reading

comprehension. But the SIFE status of the students is determined based on an interview with the students' parents or guardians rather than on an assessment of the L1 skills of the student or on educational records, as these often do not exist. In a study on the characteristics of SIFE, Klein and Martohardjono (2006) found that the SIFE designation is not predictive of the L1 academic skills of students. Students not labeled as SIFE were seen to perform well below grade level on L1 academic tasks and students labeled as SIFE at times performed better than those not labeled as SIFE. Thus, the official SIFE designation is not necessarily indicative of the L1 academic skills a student possesses.

7. Discussion

The study presented here aimed to address the question of whether existing reading skills in the L1 or linguistic knowledge of the L1 or L2 played the most important role in L2 reading comprehension among a population of newcomer adolescent ELLs who speak Spanish as their native language and have a range of academic skills in their L1. The students evidenced a range of L1 reading abilities, scoring on average between the fifth and sixth grade level in Spanish academic reading comprehension, with some students scoring at or below the second grade level and some students scoring at the eleventh grade level. One important point to note is that the individual scores are clustered near the low end of L1 reading ability; on average the students are scoring three to five grade levels below the expected grade level of ninth or tenth grade.

Another important characteristic of the students in the study that is necessary to consider is that they have low levels of L2 proficiency. As the students were all newly arrived immigrant students, having been in the United States for less than two years at the time of the study, they had not had the time to become advanced L2 learners. Thus, although the students have a range of L2 proficiency (scoring between the third and eleventh grade level on L2 reading vocabulary and between 39% and 97% correct on L2 syntactic processing), they are again concentrated on the lower end of the spectrum due to their limited time learning English, scoring on average at the fourth grade level on L2 reading vocabulary and 77% correct on L2 syntactic processing.

The characteristics of the population are important to consider when interpreting the results from the study. The findings are relevant for better understanding the development of L2 reading among newcomer adolescents in U.S. high schools, but the

results may or may not hold for other groups of L2 learners. The existing research on L2 reading comprehension among adolescents has not included participants similar to those in the present study, but has included mostly college-age students who are learning a foreign language. An important question raised in previous sections was whether or not the present study would have similar findings as the previous research. Important differences to consider between the present study and the previous studies on L2 reading comprehension are the learning situations of the students and the student characteristics. The students in the present study differ from those included in previous research in that they have a range of reading skills in their L1 and they are native speakers of Spanish learning English in U.S. high schools.

Thus, while the study is important theoretically, in that it addresses the question of the relative importance of existing reading skills and L2 linguistic knowledge in L2 reading, it is important to note that the findings do not necessarily apply to all adolescent L2 learners. The findings expand on the existing research by including adolescent newcomers, specifically those who have very low L1 reading skills, in addition to those who have more age-appropriate L1 reading skills. The aim of the study was to look at the relative importance of L1 reading and L2 proficiency in L2 reading among a group of students who had a true range of L1 reading skills. And the findings are important in better understanding how to educate adolescent newcomers. However, the unique characteristics of the population (in that all the students speak Spanish and are at the lower end of L2 linguistic knowledge, as well as of L1 reading skills) deem it necessary to proceed with caution in extending the results and implications to the larger population of adolescent L2 learners. This is necessary not only in foreign language learning

situations, but also for other groups of ELLs in U.S. schools who have different characteristics. For example, adolescent ELLs in U.S. schools who have been in the United States for many years, and who may have been born in the U.S., will not have the same characteristics as the students in the study presented here. Their development of L2 reading comprehension will likely differ in many ways from that of newcomer adolescents, in that some of the U.S.-born ELLs will not have been instructed in their L1 and all will have received some instruction in L2 reading from the beginning stages of reading development. In contrast, newcomer adolescent ELLs will likely have received some instruction in reading in their L1 (and if not, then they will likely have not received any reading instruction) and will have lower L2 proficiency than will adolescent ELLs who are not newcomers and have had more opportunity and time to acquire English.

I will now discuss the results in relation to each of the research questions of the study.

7.1 Main research question: do reading skills in the L1 or language skills in the L1 or L2 play a stronger role in L2 reading comprehension?

The present study finds that L1 reading comprehension is the most important predictor of L2 reading comprehension. Existing reading skills appear to be more important than L2 linguistic knowledge in the development of L2 reading comprehension among adolescents who are in the beginning stages of L2 development. Thus, the study supports the notion that a learner's L1 reading ability transfers to the L2 and that the reading skills developed in the L1 are available to the learner when he or she is learning to read in a second language.

The results from this study are similar to those in the pilot study conducted with newcomer adolescent ELLs with low L1 reading skills, but the role of L1 reading

comprehension is even stronger in the present study than in the pilot. Even when the L2 vocabulary measure involves all items with significant amounts of reading, L1 reading comprehension is still the stronger predictor of L2 reading comprehension in the study presented here. From the pilot study, we concluded that L1 reading comprehension skills transferred to the second language, even when the skills were not well-developed. This study supports this notion, and gives stronger evidence for the importance of existing reading ability for newcomer adolescent ELLs' development of L2 reading comprehension.

In the present study, participants with both low and high levels of L1 reading comprehension were included. Such a study including students with a true range of L1 reading comprehension looking at the relative importance of existing reading skills and L2 proficiency on L2 reading comprehension had previously not been done. It appears that when we have participants with a true range of L1 reading ability, we see that existing reading ability is a stronger contributor to L2 reading comprehension than is L2 vocabulary. Previous research may have found a stronger role for L2 vocabulary because the participants in the study all had age-appropriate levels of L1 reading comprehension. However, based on the study reported here, we have evidence that in fact L1 reading ability is a stronger contributor to L2 reading comprehension than L2 proficiency.

The study found that L2 linguistic skills played a stronger role in L2 reading comprehension than did L1 linguistic skills. In the present study, L1 vocabulary was the only L1 linguistic skill investigated. The L1 syntax measure in the current study served as a control variable and was not entered into the regression analyses due to the ceiling

effect – all the students scored very well on the test of L1 syntactic processing (with a mean score of 90%).

L1 reading vocabulary did not play a significant role in the regression model when all of the predictor variables were entered, but was significantly correlated with L2 academic reading comprehension. It was found that L1 reading vocabulary is indirectly related to L2 reading comprehension through L1 reading comprehension. A regression was run in which L1 reading vocabulary was forced into the model prior to L1 reading comprehension, and L1 reading vocabulary was found to play a significant role in L2 reading comprehension when L1 reading comprehension was not included. However, once L1 reading comprehension was entered into the regression, the significance of L1 reading vocabulary disappeared. This suggests that the effects of L1 vocabulary were subsumed under the effects of L1 reading comprehension.

7.2 Does the role of L1 reading comprehension differ when two different measures of L1 reading comprehension are used?

The finding that L1 reading comprehension was a stronger predictor of L2 reading comprehension than L2 vocabulary was consistent when L1 reading comprehension was measured with different assessments. When looking at two separate measures of L1 reading comprehension, we found that L1 reading comprehension played the most significant role. One measure was a parallel measure to the L2 reading comprehension test, and it had a stronger relationship with L2 reading comprehension, which is to be expected. However, a very different test of L1 reading comprehension still evidenced a stronger relationship with L2 reading comprehension than did the other predictor variables. These results give strong support for the idea that L1 reading skills are more important in learning to read in the L2 than are L2 linguistic skills, although both are

important. Past research has not had similar findings, most likely due to the fact that the students did not have a true range of L1 reading skills, and potentially due to the different sociolinguistic characteristics of the populations.

7.3 Within the L2, does syntax or vocabulary have a stronger relationship with L2 reading comprehension?

The L2 linguistic skills of reading vocabulary and syntax were both found to be significant predictors of L2 reading comprehension, but as hypothesized, L2 reading vocabulary had the strongest relationship. The test of L2 reading vocabulary was a measure of cognitive academic language proficiency (CALP). The L2 reading vocabulary assessment also involved reading in the L2 in order to show vocabulary knowledge.¹⁸ On the other hand, the test of L2 syntactic processing was administered orally and involved listening comprehension; it did not require any reading in the L2. Furthermore, the test of L2 syntactic processing involved basic interpersonal communication skills (BICS) to a greater degree than CALP. The syntactic structures that were tested are benchmarks of language development among children, and are thus less academic in nature than the vocabulary items included in the L2 reading vocabulary measure. As the dependent variable in the study was L2 academic reading comprehension, it is not surprising that the academic vocabulary measure was more closely related to it than the less academic test of syntactic processing. In order to look more closely at the relationship between the skills of L2 vocabulary and L2 syntax, future studies could use tests of L2 skills that measure more similar types of L2 proficiency. For example, the assessment of syntax could aim to look at more complex syntactic structures and involve production as well as comprehension, leading to a test more of CALP than BICS. But it is important to note

¹⁸ Unfortunately the measure of oral vocabulary administered as part of the study was not included in the results addressing the research questions due to invalid testing procedures.

that both L2 proficiency measures were significantly related to L2 academic reading comprehension, which is in line with previous research.

The relative importance of the L2 skills of vocabulary and syntax in L2 reading comprehension remains unclear. Some research has suggested that L2 vocabulary is the strongest predictor while other research has found that L2 syntax is more closely related to L2 reading comprehension. The number of studies comparing the relative importance of these two language skills to L2 reading is small, and thus more research is needed. Shiotsu and Weir (2007) found that L2 syntax was the stronger predictor of L2 reading comprehension than was L2 vocabulary. The researchers argued that previous research that had found a stronger role for L2 vocabulary had some methodological issues. For example, Brisbois' (1995) vocabulary measure tested knowledge of words that were taken from the measure of L2 reading comprehension. Furthermore, Shiotsu and Weir argued that the statistical analyses used in previous research did not accurately capture the relationships among the variables and suggested that future research use structural equation modeling in order to address the relative importance of L2 vocabulary and syntax on L2 reading comprehension.

7.4 Does the relative importance of L2 academic vocabulary in L2 reading comprehension lessen when only including vocabulary items that don't require significant amounts of reading?

The question about the oral and reading vocabulary measures differentially predicting L2 reading comprehension was not able to be addressed due to the limitations of the oral vocabulary measure. However, in order to get a better picture of the role of different vocabulary subskills in L2 reading comprehension, the reading vocabulary test's subskills were analyzed separately. The three subskills involve different types of

vocabulary knowledge. The multiple meaning words subtest assesses depth of vocabulary knowledge in that it tests how many meanings of one word the student understands. The synonyms items, although in a sense also measure depth of vocabulary knowledge in that they involve knowing more than one word for a given concept, are a measure more of vocabulary breadth because they measure knowledge of multiple words. The context clues items are also more a measure of vocabulary breadth in that the student must know the simpler synonym for the target word in the sentence; in order to use the context in the sentence to guess the meaning of an unknown word, the student must know a vocabulary item for the concept being addressed in the test item and be familiar with the answer choices.

The subskills are significantly related to one another, which is in line with the limited research on the relationship between breadth and depth of vocabulary knowledge in L2 learners. For example, Nurweni and Read (1999) found that a measure of vocabulary depth and a measure of vocabulary breadth were significantly correlated ($r = .62$). In the present study, the measure of synonyms is significantly correlated with that of multiple meaning words ($r = .52$; $p < .001$), and the measure of context clues is also significantly correlated with that of multiple meaning words ($r = .62$; $p < .001$). However, in the regression analysis with the subskills of the reading vocabulary assessment, the multiple meaning words items were found to be the only ones that were significantly predictive of L2 reading comprehension.

Qian (1999) noted the lack of research on the specific L2 vocabulary components, particularly depth of vocabulary knowledge, in L2 academic reading comprehension. Qian looked at the contribution of both vocabulary depth and breadth in L2 academic

reading comprehension and found that vocabulary depth accounted for 11% of the unique variance in L2 academic reading comprehension and vocabulary breadth accounted for 3% of the unique variance in L2 academic reading comprehension. Thus, there is some preliminary evidence that vocabulary depth is a stronger contributor to L2 academic reading comprehension than vocabulary breadth. However, as Qian notes, the two skills are interrelated and both are involved in L2 reading comprehension. The findings in the present study may be related to the findings of Qian and the idea that vocabulary depth is the most important aspect of vocabulary knowledge in academic reading comprehension.

The multiple meaning words items also include the most reading. As noted in the pilot study, the vocabulary items with the most reading required have the strongest relationship with reading comprehension. In the larger study, the L2 vocabulary measure, even when it included significant amounts of L2 reading, was not the strongest predictor of L2 reading comprehension, as it was in the pilot. This finding from the larger study provides more support for the importance of L1 reading comprehension in the development of L2 reading comprehension—even when the L2 vocabulary measure requires significant amounts of reading in the L2, L1 reading comprehension is a stronger predictor of L2 reading comprehension.

7.5 Will there be an interaction between the predictor variables of L1 reading comprehension and L2 vocabulary?

No evidence for either threshold hypothesis – Clarke’s reading threshold hypothesis or that based on Cummins’ bilingual threshold hypothesis – was found in the study, in that no interaction between L1 reading comprehension and L2 vocabulary was found. Thus, in this study, it does not appear that a low level of L2 proficiency prohibited the students from using their L1 reading skills, as in previous studies supporting Clarke’s

threshold hypothesis. However, unlike in previous studies, many of the students with low L2 proficiency also had low levels of L1 reading skills. It is likely the case that in a group of students with high levels of L1 reading skills, a low level of L2 proficiency will prohibit a student from using his or her well-developed L1 reading skills, as evidenced in the literature. But in this study, the students with low levels of L2 proficiency did not exhibit the same sort of relationship – that is, the low L2 proficiency did not prohibit the students from using their L1 reading skills.

I hypothesized that a low level of L1 reading skills would prohibit students from using their higher L2 proficiency skills when reading in the L2, and that a threshold for L1 reading ability may exist. This is in line with Cummins' bilingual threshold hypothesis which states that a low level of L1 skills can prohibit a student from fully developing his or her L2 skills. However, no evidence was found for this hypothesis. Again, the traits of the population may help explain this finding, in that none of the students had very high levels of L2 proficiency. Thus, no students with low L1 reading skills were prohibited from using their higher level L2 proficiency because none of the students evidenced such a high level of L2 proficiency that a very low level of L1 reading skills would suppress.

As noted earlier, the students in the study were at the beginning stages of L2 development, with many students just beginning to learn English and others in their second year of studying English in the United States. The students did evidence a range of skills in the L2, both in terms of vocabulary knowledge and syntactic processing, but none of the students were at an advanced level of L2 proficiency. In order to more fully explore the relationship between L1 reading comprehension and L2 proficiency in L2

reading comprehension, participants with a higher level of L2 proficiency would be useful to include. A longitudinal study would be necessary in order to further address the development of L2 reading comprehension among adolescent newcomers. In order to determine the role of the L2 proficiency versus L1 reading comprehension, the students must be tested on L1 reading comprehension before they have been in U.S. schools for very long, as they may lose some of their L1 skills if enrolled in L2 classes and do not use or build upon their L1 skills. And in order to have participants with advanced levels of L2 proficiency, the students need to have more time in the United States with more instruction in and exposure to English.

7.6 Will the components of L2 reading comprehension play different roles in those with low versus high levels of L1 literacy?

A comparison of the development of L2 reading comprehension among students with low levels versus high levels of L1 reading comprehension has not been reported on in the literature. In order to tentatively address the question as to whether or not L2 reading comprehension will differ between the groups, separate analyses with a low group of L1 readers and a high group of L1 readers were performed. These results can only be used to draw tentative conclusions as the number of students in each group is so low. Future research comparing a large group of low L1 readers with a large group of good L1 readers is needed in order to further address the question.

However, the results suggest that different aspects of L2 proficiency play more important roles among the two different groups, with academic vocabulary being more important among the good readers and syntactic processing being more important among the poor readers. This finding is in line with research suggesting that beginning, or low level, readers struggle with automatizing the processing of complex syntax. This slower

processing leads to poor comprehension as the reader's resources are being used in the processing of language and there are few other resources available for the higher-level comprehension required to be a good reader.

7.7 Will the components of L2 reading comprehension play different roles in those with low versus high levels of L2 proficiency?

Previous research on L2 reading comprehension among adolescents has asked this question in order to test the threshold hypothesis. The assumption has been that if the threshold hypothesis holds, then L1 reading comprehension will not play a strong role in L2 reading comprehension among students with low L2 proficiency, but will be seen to play a role in L2 reading comprehension in students who have reached the threshold level of L2 proficiency, as the L1 reading skills can only transfer to the L2 once the threshold has been reached.

In the present study, it appears that for both students with high and low levels of L2 proficiency, L1 reading comprehension plays the most important role in L2 reading comprehension. Thus, the results differ from those of previous studies and do not support the claim that L1 reading skills can only transfer and play a role in L2 reading once a threshold level of L2 proficiency has been reached.

While it is true that previous research has found that L1 reading plays a stronger role in students with higher levels of L2 proficiency, it is not necessarily the case that these results provide evidence that L1 reading skills cannot be transferred to the L2 until a certain level of L2 proficiency has been reached. Instead, it is likely the case that in previous research the fact that the students all had high levels of L1 reading comprehension influenced this result. Students with high L1 reading skills may not be

able to draw upon these higher-level skills until they have the L2 proficiency in place required to perform higher-level comprehension tasks. However, this is not to say that no L1 reading skills transfer to the L2 until this proficiency threshold is reached. The present study provides evidence that in fact L1 reading skills can transfer to the L2 at the beginning stages of L2 development, and that when the students have a range of L1 reading abilities, it is these abilities that play the most important role in the students' L2 reading.

8. Conclusion

Based on the study reported here we have a better picture of the components involved in L2 academic reading comprehension among adolescent newcomers who speak Spanish as their native language and are in the beginning stages of learning English. The results suggest that the existing reading skills a student has in his or her native language are the strongest predictors of the student's reading skills in the second language. Reading-specific skills appear to transfer very early in the process of second language acquisition. There is no way to prove the interdependence hypothesis and immediate transfer, but this study provides evidence that the reading skills a student has developed in the L1 are available in the beginning stages of L2 learning, when the students have a range of L1 reading skills.

The L2 proficiency of the students, while it did play a significant role in L2 reading comprehension, was not the strongest predictor in the study reported here as it has been in previous research on L2 reading among adolescents. The population of students included in the present study have not been included in the research program on L2 reading comprehension, and the results are thus particularly important in the education of newcomer adolescents in U.S. schools. It may be the case that previous research has found L2 proficiency to be the strongest predictor of L2 reading comprehension because the students all had age-appropriate levels of L1 reading comprehension and thus the role of L1 reading comprehension was not adequately addressed in the previous research. However, the other characteristics of the students may also explain some of the different findings. For example, previous research that found a stronger role for L2 proficiency than for L1 literacy in the development of L2 reading

comprehension was largely conducted with students learning a foreign language at the college level. The different learning situations and sociolinguistic factors at play in the different populations may also explain some of the different findings. A study by Carrell (1991) provides some tentative evidence that this may be the case. The study found that among students learning a foreign language (native English speakers learning Spanish), L2 proficiency was the strongest predictor of L2 reading comprehension, whereas among students learning a second language (native Spanish speakers learning English), L1 reading comprehension was the strongest predictor of L2 reading comprehension. However, Carrell did not compare the L1 reading levels of the two groups and L2 proficiency was measured according to the course students were enrolled in; these two methodological issues make it difficult to conclude that the different learning situations were the cause of the different findings.

Another important comparison to make is between the L2 reading development of children and older learners. The research on L2 reading among emergent bilingual children who are dominant in their L1 has provided evidence that L1 reading is an important predictor of L2 reading, in that students instructed in their L1 often have higher L2 reading skills than students instructed only in their L2. While most of the studies on children do not directly compare the role of L1 reading comprehension and L2 proficiency in L2 reading comprehension, many of the findings point to a more important role played by L1 reading comprehension. And the few studies that suggested that L2 proficiency played a stronger role than L1 literacy skills had some methodological issues that merited being cautious with the results (for example, including participants who were not necessarily L1 dominant, and measuring L2 proficiency with course grades based on

teacher ratings). The results from the study presented here look more like the previous research findings on children's development of L2 reading comprehension.

Regardless of the relationship with previous research on different populations, it is clear that the L1 reading skills that newcomer adolescent ELLs bring with them to schools in the United States are important in the students' development of L2 reading comprehension. Currently the L1 academic skills of adolescent newcomers are not assessed upon entry to U.S. schools. Instead, adolescent newcomers' level of English proficiency is assessed in order to place the students in different instructional settings. This practice assumes that L2 proficiency is the most important factor in students' development of L2 academic skills, including L2 reading comprehension. However, the present study suggests that understanding students' L1 academic skills is more important in the development of L2 academic skills, and a student's level of L1 skills should be used to place students in appropriate instructional settings.

The findings from previous research on L2 reading comprehension among adolescent learners do not directly apply to adolescent newcomers in U.S. schools. The assumption that L2 proficiency is the strongest predictor of L2 reading comprehension is unfounded when looking at this particular population of students. Instead, both the pilot study on SIFE and the larger study on newcomer adolescent ELLs with a range of L1 academic skills reported here, suggest that the students' level of L1 reading comprehension is a more important factor in their development of L2 reading comprehension than is their level of L2 proficiency.

Appendices

Appendix A: Description and sample of *RISLUS Syntax Test*

Appendix A: Description and sample of *RISLUS Syntax Test*

Structures tested, with example sentences in English:

4 types of coordination:

- a) Subject: The bear and the dog chase the cat.
- b) Object: The dog pulls the monkey and the bear.
- c) Verb: The dog pushes and punches the monkey.
- d) Sentence: The bear swims and the dog walks.

3 types of relative clauses:

- a) Object-Subject: The cat pushes the bear who holds the monkey.
- b) Subject-Object: The dog who the bear punches dances.
- c) Subject-Subject: The bear who touches the dog dances.

2 types of temporal adverbial clauses:

- a) Natural sequence: After jumping, the dog kicks the cat.
- b) Reverse sequence: The dog punches the cat after sleeping.

2 types of subjectless subordinate clauses:

- a) The cat tells the bear to jump.
- b) The monkey promises the dog to sleep.

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