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Reading Attitudes as a Predictor of Latino Adolescents' Reading Comprehension

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ABSTRACT OF THE DISSERTATION

Reading Attitudes as a Predictor of Latino Adolescents' Reading Comprehension

by

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Although literacy skills have been associated with critical academic, social, and economic outcomes, most adolescents in the United States lack basic proficiency in reading comprehension. Experts in the field of adolescent literacy have identified affective components of reading (e.g., reading attitudes) as a critical topic in need of further research. Prior research has found a significant correlation between affective components of reading and reading comprehension, even after controlling for cognitive covariates (e.g., vocabulary). However, the bulk of this research has been limited to first language learners and children in the early grades. Therefore, this study extends the reading attitudes literature by examining these relationships among Latino adolescents, including those who speak English as a second language. Furthermore, reading attitudes

has predicted reading comprehension growth among certain populations, although the mechanisms behind this relationship are unclear. This study theorizes that reading attitudes promotes reading development by facilitating incidental vocabulary acquisition through increased reader engagement and implicit strategy use. Therefore, this study also extends the literature by determining whether reading attitudes predicts vocabulary growth from September to June of ninth grade. Participants were 128 ninth grade students in a low-income, predominantly Latino high school. 24% spoke English only (EO), 26% were from Spanish-speaking homes but had been determined to be initially fluent-English-proficient (I-FEP) at enrollment, 21% were classified as "true" English learners (ELs) who had not yet attained proficiency in English, and 29% were former English learners who had been redesignated fluent-English-proficient (R-FEP). Reading attitudes were assessed using an adapted form of the Elementary Reading Attitudes Survey (ERAS), which contains both recreational (ERAS-R) and academic (ERAS-A) reading subscales. In a hierarchical regression analysis (HRA), the ERAS-R independently predicted reading comprehension after controlling for language group, vocabulary, and word reading ability (i.e., decoding, word recognition, and fluency). No language group interactions were detected. In a second HRA, the ERAS-R predicted students' vocabulary at the end of ninth grade after controlling for language group, prior vocabulary achievement, and word reading ability. However, reading attitudes only predicted vocabulary development for EO and R-FEP students, while no effect was present for I-FEP children and "true" ELs.

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CHAPTER 1
Introduction

This chapter introduces the problem of reading comprehension and defines the population of interest, Latino adolescents in the United States, particularly those who speak English as a second language. This is followed by a justification for studying the reading comprehension of adolescents and English learners. Next, the constructs of interest are defined in light of prior literature, with an emphasis on reading attitudes and related affective components of reading. Finally, this chapter provides the purpose of the study, followed by the two research questions.

The Problem of Reading Comprehension

Reading comprehension has been the target of a wide body of educational research and justifiably so, as 66% of U.S. fourth graders as well as 66% of U.S. eighth graders tested below proficient on assessments of text recall, interpretation, and evaluation (National Assessment of Educational Progress (NAEP), 2011). Proficient literacy is essential for accessing all domains of the academic curriculum, reading skills are known to exhibit a compounding effect over time, and student literacy has consistently been associated with critical outcomes such as dropout rate and success after high school (Rubin, 1974). According to Heller and Greenleaf (2007):

> Policymakers must recognize that reading and writing are more than just basic skills that permit students to go on to study advanced subject matter; reading and writing are also the very stuff from which the academic content areas are made. Unless students continue to develop their literacy skills … they will make no real progress in those subjects. (p. 6)

Reading research is also critical because literacy skills tend to have a compounding effect over time. Termed the "Matthew Effect," students who possess strong reading skills at an early age are more likely than students with poor reading skills to increase their level of proficiency over time. In a longitudinal study of 8- through 16-year-olds, Cain and Oakhill (2011) found that a child's initial level of reading comprehension at age 8 predicted vocabulary at ages 11, 14, and 16 after controlling for general ability and vocabulary skills at age 8.

Literacy skills have profound and lifelong consequences. A recent study found that 15-year-old children with poor reading abilities were more likely to experience suicidal ideation than youth with average reading skills, even after controlling for demographic and psychiatric variables (Daniel et al., 2006). According to the National Assessment of Adult Literacy, adults with higher levels of literacy are more likely to be employed full-time, are more likely to earn higher salaries, and are less likely to be unemployed than adults with lower literacy levels (Kutner et al., 2007). Adults with proficient literacy are also more likely to be employed in professional occupations, are much less likely to be employed in service occupations, and are more likely to vote in an election. Women with higher literacy levels are less likely to receive public assistance. Parents with higher levels of literacy are more likely to teach their children the alphabet, talk to their children about school, and help their children with their homework.

Fortunately, there is evidence that schools which focus on literacy can succeed in improving their students' academic performance (Theroux, 2010). By drawing on emerging research in the fields of developmental and educational psychology, educators

can develop effective interventions for meeting the literacy needs of students of all ages. The key to success is to identify the critical areas of need, expand research in these fields, and then bridge the gap between the university and the classroom.

Defining the Population of Interest

In the present study, the population of interest is Latino adolescents in the United States, particularly those who speak English as a second language (i.e., English learners). Following Orosco and Klingner (2010), *Latino* will refer to a student population identified as coming from Latin America, or the ethnic group of a person of Mexican or other Spanish culture or origin, regardless of race. While there is little agreement on the precise boundaries of adolescence (Steinberg, 2005), *adolescent* will refer to a child between the ages of 14 and 17 (within the period of middle adolescence roughly corresponding to high school).

The term *English learner* is more difficult to define, as it may have a precise legal meaning imposed by a government agency or a theoretical definition dictated by the researcher. In the United States, public schools are evaluated based on the *annual yearly progress* (AYP) of various disaggregated student subgroups. The federal Department of Education uses the term *limited English proficient* (LEP) or *English language learner* (ELL) to classify the subgroup of students who speak English as a second language and who have not yet achieved proficiency in English as well as students who have achieved proficiency in English but are still being monitored based on their academic achievement. The individual states are provided with some flexibility as to how narrowly they choose to define this group.

In the state of California, students in this subgroup are referred to as *English learners* (ELs). California school districts must follow carefully prescribed procedures for identifying and monitoring their ELs. This process begins with a home language survey administered to all new enrollees. This survey asks the parent to identify which language the child spoke when he or she first began to talk, the language the child uses most frequently at home, and the language most often spoken by adults in the home. If the parent indicates English to all of these questions, the child is classified as *English only* (EO). If the parent indicates a language other than English for any of these questions, the child is administered the California English Language Development Test (CELDT) to assess the child's level of English proficiency. If the child demonstrates a level of proficiency comparable to that of a native English speaker, he or she is designated *initially fluent-English-proficient* (I-FEP).

However, if upon enrollment the child is determined to lack the English language skills necessary to succeed in the school's regular instructional program, the child is classified as an EL. ELs received specialized instruction and are continually monitored to determine the point at which they demonstrate English language proficiency comparable to that of average native English speakers and may be *reclassified fluent-English-proficient* (R-FEP). For purposes of determining AYP, California has chosen to define the EL subgroup as ELs who have not yet been reclassified (i.e., "true" ELs) as well as R-FEP students who have not scored at the proficient level or above on the English Language Arts California Standards Test (ELA CST) at least three times after being reclassified (CDE, 2013).

For the purposes of this study, the term English learner will be broadened slightly to include "true" ELs as well as all R-FEP students. These are students for whom their primary home language is Spanish and who entered school with limited English proficiency. This definition is generally consistent with the literature, although there is certainly diversity in the precise terminology (with authors in non-English-speaking countries favoring the term *second language learner*) and its application. Proctor, August, Carlo, and Snow (2005) considered their participants to be English learners if Spanish was the primary language spoken in the home. Nakamoto, Lindsey, and Manis (2008) classified children in a Texas town bordering Mexico as English learners if they had very limited knowledge of English at the beginning of kindergarten (as established by a language assessment test). In Lervag and Aukrust's (2010) study of first and second language learners in Norway, second language learners were children whose parents spoke a nonnative language at home (Urdu) more often than Norwegian. Similarly, Droop and Verhoeven (2003) investigated ethnic minorities in the Netherlands and defined second language learners as children who interacted with their mothers and fathers most often in a language other than Dutch.

Justification for Studying Adolescents

Over the past 20 years, schools in the United States have made impressive progress in improving the reading performance of young children in grades K-3 (Theroux, 2010). Unfortunately, these gains have not been extended to the upper grades. This results in the graduation of students who are unprepared for college and the workforce. Universities are forced to expend scarce resources on remedial reading

courses, as companies collectively spend billions to improve the literacy skills of their new employees. School reform is desperately needed in the secondary grades, but there is a lack of agreement on what amounts to effective reading instruction after age eight.

Adolescents represent an understudied population in the field of reading research. Understandably, most intervention research has been focused on elementary-aged students, as conventional wisdom dictates the value of abetting children while they are still young and stand to reap the greatest benefit from effective instruction. Even so, many of these students enter high school without the basic reading skills that are essential for academic success. According to the NAEP (2011), 66% of U.S. students enter high school without grade-appropriate proficiency in reading. Impatient with the lack of progress attained at the state level, some researchers have gone so far as to declare an "adolescent literacy crisis," calling for the federal government to play a more active and comprehensive role (Haynes, 2011).

Reading experts now assert that there is no "silver bullet" for solving the adolescent literacy crisis, yet there is some general agreement on two problems which would benefit from intervention (Theroux, 2010). First, an absence of systemic literacy planning in secondary schools means that teachers do not have clearly defined literacy goals. Practitioners do not know which elements are most important to adolescents' reading achievement, nor do they know how they are developed. Second, there is a steady decline in students' attitudes toward reading as they proceed through the later grades of their educational career. This has prompted some literacy experts to recommend that teachers provide high-interest low-reading-level texts to unmotivated

students. However, little is known about the way the affective components of reading relate to overall reading achievement, leaving reading attitudes-oriented interventions without clear direction.

Justification for Studying English Learners

The identification of at-risk readers is no mystifying endeavor. In fact, some student populations are far more likely to struggle with reading than their peers. English learners are at especially high risk for reading failure because of the confounding influences of the language acquisition process (August & Shanahan, 2006). When content demands increase, so does the demand on literacy. To be successful academic readers, children must be able to quickly recognize words, efficiently acquire new vocabulary, and process content critically while reading. Furthermore, students must develop a positive attitude toward reading which can endure through graduation. Cultural and linguistic minorities are very likely to face difficulties in one or more of these areas.

U.S.-born children of immigrants from Spanish-speaking homes are the most rapidly growing segment of the school-aged population in the United States (Fry & Gonzales, 2008). In fact, English learners now constitute 23.2% of the total enrollment in California public schools (CDE, 2012), and 27.4% of the state's students speak a language other than English in their homes. Of these, 82.7% speak Spanish. Unfortunately, these language minority students often experience multiple risk factors associated with poor academic outcomes. English learners are also more likely to live in poverty or at near poverty level (Hernandez, Denton, & Macartney, 2008) and with

parents who have little education (Capps et al., 2005). Language minority students are also more likely to attend low-income underperforming schools (Consentino de Cohen, Deterding, & Chu Clewell, 2005). Spanish-speaking English learner status is commonly associated with poor reading outcomes (August & Shanahan, 2006), and Latino students make up nearly half (46%) of all high school dropouts (Snyder, Dillow, & Hoffman, 2007). In light of these statistics, educational researchers cannot afford to ignore the changing needs of U.S. schoolrooms. However, relatively little research has been conducted to investigate the variables affecting patterns of reading development among English learners, and the existing literature focuses almost exclusively on primary grade students (Mancilla-Martinez & Lesaux, 2010).

In school districts that serve a large immigrant population, it is not uncommon for secondary schools to enroll new adolescent students who were undereducated in their country of origin. In California, 29% of English learners are enrolled in the secondary grades, seven through twelve (CDE, 2012). However, since English learners require six to ten years to acquire grade-appropriate proficiency in reading (Hakuta, Goto Butler, & Witt, 2000), these adolescents are running out of time to achieve the language skills they will need in order to get ready for graduation and prepare for life after high school. As the population of middle school and high school level English learners increases, additional research is greatly needed. "Unfortunately, the unique needs of these older EL students are even more overlooked than those of their younger peers" (Gandara, Rumberger, Maxwell-Jolly, & Callahan, 2003, p. 3).

Defining the Constructs of Interest

A comprehensive model of reading comprehension is outside the scope of this study, and there are multiple important constructs which will not be included (e.g., background knowledge, strategy use, instructional approach). However, four key reading-related constructs have been selected for investigation (i.e., reading comprehension, vocabulary, word reading ability, and reading attitudes) because their interrelationships are theoretically relevant to the population of interest but have not been adequately explored in the existing literature. In this section, each of these constructs will be defined for the purposes of this study in light of related prior research. In the following chapter, a theory-driven explanation will be provided to justify the inclusion of each variable within the context of its respective research question.

Reading Comprehension

Reading comprehension is operationalized somewhat differently from study to study, although two main approaches stand out. One popular approach is the cloze-type test, in which the child provides the missing word from a written passage (e.g., Lervag & Aukrust, 2010; Proctor et al., 2005). The other most common approach is the multiple-choice test, in which the child reads a passage and answers a series of comprehension questions (e.g., Cain & Oakhill, 2011; Cromley & Azevedo, 2007; Cromley, Snyder-Hogan, & Leciw-Dubas, 2010). It is not uncommon for researchers to incorporate both types of assessments into their research. In a study of fourth through ninth graders, Tilstra, McMaster, van den Broek, Kendeou, and Rapp (2009) found significant correlations between cloze tasks and multiple-choice assessments ranging from .62 to .80.

Among third and fourth graders, Dutch researchers found these "text coherence" and "text cohesion" measures to be highly correlated and included them as indicators of a single reading comprehension factor (Droop & Verhoeven, 2003). Fortunately, these reported high correlations help alleviate reservations about the adequacy of either approach.

When working with large sample sizes, group-administered multiple-choice tests are the more practical measure of reading comprehension, and these are often employed in studies of adolescents. In a study of reading motivation, Unrau and Schlackman (2006) administered a standardized multiple-choice test to 2,000 middle school students in Los Angeles, which included questions of both literal and inferential comprehension. Similarly, Samuelstuen and Braten (2005) used a multiple-choice test to assess the reading comprehension of 78 Norwegian tenth graders. This is the approach that has been adopted for the present study. The use of a group-administered, multiple-choice test is consistent with the existing adolescent reading literature, and it more closely approximates the type of reading tasks children with which children are confronted in school. Thus, in the present study, *reading comprehension* will refer to the students' ability to silently read passages of varying genres and answer multiple choice questions assessing their literal and inferential comprehension of those passages.

Vocabulary

Vocabulary knowledge is defined and operationalized differently depending on the theoretical orientation of the study and the age and language background of the child. In a study of English learners in Grade 4, Proctor et al. (2005) used a picture vocabulary

test, which required the student to name both familiar and unfamiliar pictured objects, ordered by increasing difficulty. A similar approach was adopted by Nakamoto et al. (2008) in a study of English learners in Grades 3 through 6. In a study of children in Grades 3 and 4, Droop and Verhoeven (2003) used both productive and receptive tests, which provided a spoken word which the child was required to match up to one of four pictures, and which required the child to provide a definition for 25 words. The latter was similar to the approach of Lervag and Aukrust (2010), who asked second graders to define words from a published intelligence test.

In reading studies involving older children, there is a trend toward written, paper-and-pencil vocabulary tests, although oral assessments are occasionally used (e.g., Tilstra et al., 2009). Hood and Dubert (1983) assessed the vocabulary knowledge of children in Grade 9 using a standardized paper-and-pencil test, wherein words were presented in context and students chose the best synonym from among five alternatives. Cromley and Azevedo (2007) also assessed ninth graders' vocabulary using a standardized, multiple-choice, paper-and-pencil test, which required students to select a correct definition from among five options. Cain and Oakhill (2011) assessed the vocabulary knowledge of ninth and eleventh graders using a written, standardized vocabulary subtest, in which students were required to select the word that "means most nearly the same" as a word in bold type. In a reading study involving undergraduate college students, Cromley et al. (2010) again assessed vocabulary using a multiple choice test, which presented a short phrase with one word underlined and asked participants to choose the option most closely matching the meaning of the underlined word. Similarly constructed multiple-choice

vocabulary tests have also long been employed with middle school students (e.g., Duin & Graves, 1987; Lawrence, 2012).

In keeping with the existing adolescent reading literature, vocabulary knowledge will be assessed in the present study through a standardized, paper-and-pencil, multiple-choice test. *Vocabulary* will refer to the child's ability to correctly identify the definition of a word within a written context that may suggest a part of speech but provides no clues as to the word's meaning.

Word Reading Ability

In the reading research literature, one finds a great deal of inconsistency in how word reading ability is defined and operationalized. Authors commonly refer to constructs such as alphabetic knowledge, word recognition, reading fluency, and word decoding, with these terms sometimes being used interchangeably. However, the operationalization of these constructs usually has something to do with the speed and accuracy of children's oral reading. For example, Proctor et al. (2005) assessed alphabetic knowledge through a computer-administered test of pseudoword recognition and assessed fluency by measuring the speed and accuracy of real-word recognition. Lervag and Aukrust (2010) assessed word decoding by having students read as many words as they could in 45 seconds from a standardized list of 104 words. And Droop and Verhoeven (2003) assessed decoding skills by having children read word lists of increasing difficulty and assessing both speed and accuracy.

In some instances, related word reading measures were simplified or combined. For example, Proctor et al. (2005) found that speed and accuracy were significantly

negatively correlated and decided to retain only response time as a single proxy for fluency. Nakamoto et al. (2008) created an English decoding factor using two indicators, a letter-word identification task, in which children were asked to pronounce words of increasing difficulty, and a speeded word reading task, in which children read high-frequency words aloud as fast as they could without making mistakes. And Cromley and Azevedo (2007) created a word reading composite by combining scores from three different word reading tasks. The tasks included a word recognition task, a nonsense word decoding task, and a timed reading task assessing both speed and accuracy.

In the present study, *word reading ability* will refer collectively to word identification skills, word decoding skills, and reading fluency. Word identification refers to the child's ability to correctly pronounce real words, and decoding refers to the child's ability to correctly sound out nonsense words, both without respect to time. Reading fluency refers to the child's ability to accurately read a grade-level passage out-loud within a given time limit. Since a precedent exists for combining such tasks into a single word reading composite variable (e.g., Cromley & Azevedo, 2007), factor analysis as well as other preliminary correlational analyses will be used to determine whether these three abilities should be combined into a single word reading variable for the purposes of this study.

Reading Attitudes

Following Fishbein and Ajzen (1975), *attitude* is conceptualized in this study as a conditioned inclination to react either positively or negatively to a particular stimulus. Attitude may be viewed as a continuum with positive feelings at the high end of the

spectrum and negative feelings at the low end (Alexander & Filler, 1976). Accordingly, an attitude toward reading will incline the student to either engage in or avoid a reading task. Some authors have partitioned the somewhat nebulous reading attitude construct into domain-specific interests, such as feminine or masculine topics (Naceur & Schiefele, 2005). Under this model, a student may have a positive reading attitude toward science fiction novels or books about dinosaurs, but a negative attitude toward biographies or books about child development. Alternatively, others view individual reading interests as indicators of a global attitude toward reading (Schulte, 1969).

A factor analysis conducted by McKenna and Kear (1990) revealed two distinct dimensions of reading attitude. One dimension reflected the students' attitude toward academic reading (e.g., reading textbooks, taking a reading test in school), while the other reflected the students' attitude toward recreational reading (e.g., reading during summer vacation, reading for fun). This is the paradigm that has been adopted for the present study. Throughout this and the following chapter, *reading attitudes* will refer to a singular construct reflecting both one's attitude toward academic reading as well as one's attitude toward recreational reading.

This understanding of reading attitudes is generally consistent with its usage in the literature. Conlon, Zimmer-Gemeck, Creed, and Tucker (2006) used the term "attitudes to reading" to refer to "children's like or dislike of reading" (p. 15). And in a meta-analysis of the relationship between reading attitudes and reading comprehension, Petscher (2010) conceptualized reading attitudes as students' "prevailing feelings about reading" (p. 340). While picture based assessments have occasionally been employed in

the case of very young children (e.g., Askov & Fischbach, 1973), reading attitudes is typically assessed through a written, group-administered, self-report survey, in which children respond on a Likert-type scale to items such as "Is it fun for you to read books?" (Katzir, Lesaux, & Kim, 2009) or "How do you feel about reading for fun at home?" (McKenna, Kear, & Ellsworth, 1995).

Related constructs. Reading attitudes falls under the broader umbrella of *affective components of reading* (Conradi, 2011). These are the "feeling-based" constructs that stand in contrast to the cognitive components of reading (e.g., word reading ability, vocabulary). Prior research has addressed the role of various affective components in influencing reading achievement. For example, Bohn-Gettler & Rapp (2011) targeted mood as an independent variable and determined that happy- and sad-induced participants engaged in more paraphrasing and remembered more textual details than neutral-induced participants.

The concept of interest has also enjoyed some attention in the literature, with a distinction between made between individual interest and situational interest (Eccles, Wigfield, & Schiefele, 1998). In the context of reading, individual interest refers to a stable, persistent orientation toward reading in general, and situational interest refers to an arousal toward a particular book or reading activity. Other authors have focused on intrinsic and extrinsic reading motivation (e.g., de Naeghel, van Keer, Vansteenkiste, & Rosseel, 2012). This approach is based on self-determination theory (SDT), which emphasizes the importance of the student's need for personal development and self-

regulation (Unrau & Schlackman, 2006). Intrinsic reading motivation has been consistently linked with reading behavior and reading comprehension outcomes. While the present study is specifically intended to extend the reading attitudes literature, the relative paucity of this body of research, especially as it pertains to adolescent children, demands the inclusion of reading interest and reading motivation studies in a thorough review of the literature. Furthermore, it should be noted that scales measuring reading attitudes and reading motivation contain a significant amount of shared variance. Conradi (2011) conducted a factor analysis of seven subscales measuring three different affective constructs (reading attitudes, reading motivation, and reading self-concept) and found that the seven subscales were best represented by two factors, self-beliefs and attitudes. Thus, it seems reasonable to cautiously allow reading motivation research to inform reading attitudes research, and vice versa (Schiefele, Schaffner, Moller, & Wigfield, 2012). Accordingly, the literature review in the following chapter will incorporate studies involving other affective components of reading besides reading attitudes, and the highly related concepts of reading attitudes, reading interests, and reading motivation (although not the labels) will be handled somewhat interchangeably.

Purpose of the Study

The relationships between reading comprehension, vocabulary, word reading ability, and reading attitudes have not been explored with an adolescent Latino population, and even less is known about English learners within this age group. Drawing from prior research conducted with adolescent first language learners and elementary-aged second language learners, this study will propose two theories seeking

to connect these students' reading attitudes with their reading comprehension scores. The first theory holds that reading attitudes influences reading comprehension directly by affecting the reader's level of cognitive engagement and activating implicit reading strategies. The second theory holds that readings attitudes promotes incidental vocabulary development by catalyzing the use of implicit reading strategies. Following related prior research, this study will examine these relationships within a hierarchical regression framework. The main purpose of this study is to determine whether reading attitudes should be considered for inclusion in reading models for adolescent English learners and to provide initial guidance in the placement of this variable within a theoretical and analytic context.

The two research questions are as follows:

1. Does reading attitudes predict Latino ninth graders' reading comprehension after controlling for language group, vocabulary, and word reading ability? If so, does this relationship depend on language group?
2. Does reading attitudes predict Latino ninth graders' vocabulary after controlling for language group, prior vocabulary achievement, and word reading ability? If so, does this relationship depend on language group?

CHAPTER 2

Review of Relevant Literature

This chapter will provide background information about the relationship between reading attitudes and reading comprehension. It will provide a progression through the literature, beginning with correlational research, proceeding then to studies which control for cognitive components of reading, and finishing with studies that investigate the relationship between reading attitudes and reading comprehension growth. Inconsistences in the developmental research, as well as between-group differences, will receive special attention. This is followed by a plan for extending the literature by investigating an understudied population and building a theory of reading comprehension growth. Finally, the two research questions are discussed in detail, with an emphasis on the theoretical justification for the variables of interest.

Reading Attitudes and Reading Comprehension

Experts have identified affective components of reading as a critical ingredient for sustained literacy achievement, and the Council on Advancing Adolescent Literacy placed decreased motivation for reading on the short list of problems most deserving of researchers' attention (Theroux, 2010). After developing an elaborate model of adolescent reading comprehension, Cromley and Azevedo (2007) likewise recommended that future studies explore paths that may potentially be missing, including the relationship between reading comprehension and affective components of reading. "In future research, we would like to … consider the roles of motivation in the model" (p. 322).

Correlational Research

For several decades, reading researchers have investigated the correlation between reading attitudes (as well as other affective components of reading) and reading comprehension. That this relationship would exist seems both intuitive and obvious to educational practitioners. Research shows that classroom teachers tend to perceive higher achieving students as being more intrinsically motivated while discounting lower achieving students as merely extrinsically motivated (Sweet, Guthrie, & Ng, 1998). However, the direction of causality and the complexity of these relationships are open to speculation.

In an early study of reading attitudes and reading achievement, first and third grade children were given a picture-based assessment of reading attitudes as well as the word reading and paragraph meaning subtests of the Stanford Achievement Tests (Askov & Fischbach, 1973). After controlling for gender and grade, the researchers found that reading attitudes was positively related to reading comprehension subtest scores, leading the authors to conclude that "a favorable attitude toward recreational reading might indeed be associated with good readers who have few comprehension difficulties" (p. 4).

Since then, a large number of studies have confirmed positive correlations between the affective components of reading and reading comprehension. For example, in a survey of 697 third- through fifth-graders in central Iowa, Roettger, Szymczuk, and Millard (1979) found a significant correlation of .32 between reading attitude and reading comprehension. Similarly, Walberg and Tsai (1985) found a correlation of .34 between the reading attitudes and reading achievement among 1,459 nine-year-olds. More

recently, Swalander and Taube (2007) studied the relationships between reading attitudes and reading comprehension among 4,018 eighth graders. The authors found that reading attitudes was significantly correlated with students' comprehension of expository texts (r = .35), narrative passages (r = .35), and functional documents (r = .31).

The most extensive evidence for a relationship between reading attitudes and reading ability comes from a large-scale study of elementary school students from across the United States (McKenna et al., 1995). Participants were a nationally-representative sample of 18,185 children in Grades 1 through 6. The sample was stratified by gender and ethnicity and included students from 229 schools in 95 districts located in 38 states. Reading attitudes was measured using the academic and recreational reading subscales of the Elementary Reading Attitudes Survey (ERAS). The study found that, in the first grade, recreational reading attitude was relatively positive for all ability groups. However, as grade levels progressed, the relationship between recreational reading attitude and reading ability became more pronounced. By sixth grade, children with the most positive reading attitude significantly outperformed those with more negative attitudes on teacher-reported measures of reading ability.

In 2010, Petscher conducted a meta-analysis of the relationship between reading attitudes and reading achievement, which included a total of 32 studies with a combined sample size of 224,615. The mean strength of the relationship between reading attitudes and achievement was .32, leading the author to conclude, "It is not a question of *if* a relationship between attitudes toward reading and achievement exists, but rather, *under what circumstances* does this relationship have meaning and practical value?" (p.350-

351). A few studies have answered this call for additional research by (a) employing more sophisticated designs which control for cognitive components of reading, (b) constructing longitudinal designs intended to better understand causality, and (c) comparing between-group differences (i.e., ability, ethnicity, and language) in the relationship between reading attitudes and reading comprehension.

Controlling for Cognitive Components of Reading

More recently, researchers have begun to add covariates to their models of reading attitudes and reading comprehension. Some authors include demographic information, such as socioeconomic status, gender, and grade, as well as other affective components of reading, such as self-concept. For example, in Swalander and Taube's (2007) study of eighth graders' reading attitudes and reading comprehension, reading attitudes remained a significant predictor of reading ability after controlling for goal oriented strategies, academic self-concept, and family based prerequisites (e.g., mother's education, number of books in the home). However, in seeking to bridge the gap between cognitive-focused models and affective-oriented models, a small number of studies have introduced cognitive components of reading as covariates.

Conlon et al. (2006) provided one of the first studies to expand the theoretical framework to include both cognitive components of reading and affective components of reading in the same model. In a study of 174 Australian children in Grade 7, the researchers found a significant bivariate correlation between reading attitudes and reading comprehension (r =.37), and reading attitudes remained a significant predictor of reading comprehension after controlling for demographic variables, nonverbal ability, and word

identification skills. Similarly, in a study of 67 American fourth graders (7% Hispanic), Katzir et al. (2009) found a significant correlation of .28 between children's reading attitudes and their reading comprehension. After controlling for age, verbal ability, and word reading ability, reading attitudes remained a significant predictor of reading comprehension.

Nellenbach (2010) used a multiple regression analysis to investigate the comparative influence of oral language, problem solving, and reading attitudes on sixth through eighth graders' reading comprehension scores. 60 children (65% female) participated in the study. 58% of the participants were identified as White, 35% were Black, and the remainder were either Hispanic (2%) or multi-racial (5%). Both subscales (recreational reading and academic reading) of the ERAS were significantly correlated with reading comprehension. Furthermore, after controlling for general oral language abilities, advanced oral language, and problem solving, the recreational reading subtest of the ERAS significantly contributed to students' reading comprehension scores.

Finally, in an effort to extend reading motivation research into early adolescence, Retelsdorf, Koller, and Moller (2011) surveyed 1,508 fifth through eighth graders in Germany. They found that students' reading attitudes (termed *reading enjoyment* by the authors) was positively correlated with their reading performance ($r = .21$). Again, reading attitudes remained a statistically significant predictor even after controlling for demographic background, reasoning skills, and decoding speed. These studies provide a useful precedent for combining both cognitive and affective components of reading into the same model. However, the research is limited in respect to participants' age range

(extending only through Grade 8), ethnicity (Latino children, the fastest growing population in the United States, are not represented in any of these studies), and language status (all of the studies are limited to first language learners).

Developmental Models

While the affective components of reading have been studied for decades, with a substantial portion of the literature devoted to the correlation between reading attitudes and reading comprehension, the study of attitudes as a predictor of comprehension growth is far sparser. This deficiency can be partially attributed to the extended debate over the direction of causality, with some researchers cautiously endorsing a bidirectional relationship (Morgan & Fuchs, 2007). In fact, one early study successfully predicted reading motivation at age 9 using reading comprehension scores at ages 7 and 8 as independent variables (Gottfried, 1990). However, in more recent longitudinal research, reading comprehension has since replaced reading attitudes as the dependent variable of choice.

Wang and Guthrie (2004) used an SEM approach to model the effects of intrinsic reading motivation and past reading achievement on future text comprehension. Participants were middle- to upper-class fourth grade students in the United States (N=187) and Taiwan (N=197). 90% of the American students were White. Among both ethnic groups, intrinsic reading motivation independently predicted text comprehension while controlling for the previous semester's reading grades. The next year, researchers purposed to further explore the causal relationship between reading attitudes and reading comprehension via a longitudinal design (Kush, Watkins, & Brookhart, 2005).

Participants were second grade students (N=151) in the American southwest. 94% of the students were White, and 4.9% were eligible for free or reduced lunch. Reading measures were administered in the second and third grades and then again in the seventh grade. Students' reading attitudes in elementary school, as assessed by the ERAS, independently predicted reading achievement in seventh grade after controlling for reading achievement in second and third grade. The authors concluded that "preexisting attitudes toward reading cannot be perfunctorily dismissed as an unimportant determinant of future reading achievement" (p. 38).

Later, Guthrie et al. (2007) conducted a study intended to better isolate the impact of students' reading motivation on their reading comprehension growth from September to December of their fourth grade year. Participants (N=31) were of mixed ability levels and were of primarily European American (58%) and African American (23%) descent. In order to provide a standardized measure of reading achievement, students completed the Gates-MacGinitie reading comprehension subtest in both September and December. The rationale behind this design was that, by controlling for students' prior performance on the dependent measure, the researchers could isolate individual factors contributing to the growth of students' reading comprehension during the course of the study. Through a multiple-regression analysis, the researchers found that intrinsically-oriented motivational factors, such as an interest in literary content, independently predicted reading comprehension three months later.

In 2008, Martinez, Aricak, and Jewell investigated the influence of reading attitudes and reading fluency on children's future reading achievement. Participants were

76 fourth graders in the Midwest. 99% of the children were White, and 31% received free or reduced lunch. One-minute timed reading passages were administered at three different points during students' fourth grade year. At the end of the school year, students completed the ERAS. In the fall of their fifth grade year (four months later), students completed a state-mandated, high-stakes standardized test in English language arts. In a path analysis, reading attitudes in fourth grade independently predicted reading achievement in fifth grade, controlling for reading fluency scores in fourth grade. The results of this study are consistent with the hypothesis that students' reading attitudes predict reading growth during elementary school, even over short periods of time.

The next year, Taboada, Tonks, Wigfield, and Guthrie (2009) expanded previous work with a study of 205 fourth-grade students in the mid-Atlantic region. 87% of the students were White, and 20% of the students qualified for free and reduced-price meals. Students completed assessments of reading comprehension and reading strategy use in September (Time 1) and again in December (Time 2). Students' internal motivation for reading was measured through five teacher-reported items. After controlling for reading strategy use, reading motivation independently predicted reading comprehension at a single point in time. Next, the researchers controlled for prior reading ability by adding reading comprehension at Time 1 into the regression model. Reading motivation was a significant predictor of reading comprehension growth, even while controlling for prior achievement and reading strategy use. These results suggest that affective components of reading play a significant role in children's reading development, even over a relatively short period of time.

Inconsistencies in the literature. Not all developmental models have yielded consistent results. Recently, German researchers used an SEM framework to examine the longitudinal relationships between intrinsic and extrinsic motivation and reading literacy development (Becker, McElvany, & Kortenbruck, 2010). 740 children in Berlin elementary schools were assessed in third grade, fourth grade, and sixth grade on measures of reading literacy, intrinsic and extrinsic reading motivation, and reading amount. After controlling for prior reading literacy, intrinsic reading motivation had no significant effect, either direct or indirect, on reading achievement in sixth grade. Likewise, Retelsdorf et al. (2011) found reading attitudes to be a significant predictor of fifth through eighth graders' reading achievement growth, but not after controlling for demographic characteristics and reasoning skills. Such findings suggest that the relationships between affective components of reading and reading comprehension may be moderated by sample characteristics.

Between-Group Differences

As not all studies consistently associate reading attitudes with reading comprehension, this relationship appears to be moderated by sample characteristics, including ethnic groups and language groups.

Ethnic groups. Baker and Wigfield (1999) studied the relationships between motivation-related variables and reading achievement among a sample of 371 White and Black fifth and sixth graders. While all motivational scales were related to the children's reading achievement, the associations were stronger for the White students. Wang and Guthrie (2004) used an SEM approach to model the effects of intrinsic reading

motivation and past reading achievement on future text comprehension. Participants were middle- to upper-class fourth grade students in the United States (N=187) and Taiwan (N=197). 90% of the American students were White. Among both ethnic groups, intrinsic reading motivation independently predicted text comprehension while controlling for the previous semester's reading grades, and the model was found to be invariant across ethnic groups.

Unrau and Schlackman (2006) administered a measure of intrinsic and extrinsic reading motivation and a standardized measure of reading comprehension to 1,032 economically-disadvantaged middle-school students in urban Los Angeles. Participants were 75% Hispanic and 20% Asian, and a large proportion of the children were first- or second-generation immigrants. Carrying out separate analyses by ethnic group, the researchers found surprisingly divergent results. Among Asian students, measures of intrinsic reading motivation independently predicted reading achievement while controlling for grade and gender. However, intrinsically-oriented reading motivation was unrelated to reading achievement among Hispanic students. Similarly, in a study of urban African-American middle school students in the Southern United States, Harris (2009) found no relationship between reading attitudes and reading performance among boys or girls.

Language groups. In a rare study highlighting differences between language groups, Dutch researchers compared the reading development of first language learners (N=729) and second language learners (N=93) using an SEM framework (Netten, Droop, & Verhoeven, 2011). Seven demographic, academic and affective variables, including

reading motivation, were used to predict reading literacy growth from Grade 4 to Grade 6. Among first language learners, reading motivation independently predicted reading literacy at both Grade 4 and Grade 6. However, among second language learners, reading motivation only predicted reading literacy at Grade 4.

Extending the Literature

The existing line of research is lacking in two key ways. First, most existing studies limit the age range of their participants to elementary and middle school. Of these, the majority of the children sampled are European-American or European, and very few participants are second language learners. Therefore, it is difficult to confidently generalize existing findings to Latino adolescents, particularly those who speak English as a second language. Second, existing research has failed to offer a reliable explanation for the relationship between reading attitudes and reading comprehension growth. Unfortunately, without a cohesive model, it is impossible to know if reading attitudes-focused interventions are "working." The present study seeks to extend the literature by investigating an understudied population and by building a theory of reading comprehension development.

Investigating an Understudied Population

In Petscher's 2010 meta-analysis of the relationship between reading attitudes and reading achievement, only four of the 32 included studies investigated middle school students, while the remainder focused on elementary-aged children. High school students were not represented. Furthermore, because of the general lack sample diversity, Petscher was unable to consider race or language status as potential moderators.

Therefore, the present study extends the literature by investigating adolescent Latinos while using dummy coding to directly compare students of varying language backgrounds.

Age. Multiple studies have found changes in the reading attitudes-reading comprehension relationship over time (Logan & Medford, 2011; McKenna et al., 1995), with the relationship growing stronger up through sixth grade. However, existing studies only follow children up through eighth grade. It is important to extend the literature to ninth grade because prior research suggests that patterns of reading development change at the beginning of high school (van Gelderen, Schoonen, Stoel, de Glopper, & Hulstijn, 2007), and that middle school and high school children respond differently to specific reading interventions (Cantrell, Almasi, Carter, Rintamaa, & Madden, 2010). Thus, it cannot be assumed that findings generated from primary school samples, or even from middle school students, will reliably generalize to students in Grade 9 and beyond.

Ethnic group. Furthermore, there is a general lack of ethnic diversity within the existing research. Among the children sampled in the United States, the majority were White. Among the children sampled outside of the United States, the overwhelming majority were Europeans, with a few hailing from Asian countries. Since some studies have found ethnic differences in the relationships between reading attitudes and reading comprehension (e.g., Baker & Wigfield, 1999; Unrau & Schlackman, 2006), it is important to carefully consider individual ethnic groups. Yet contemporary reading comprehension models, which include both affective components of reading and

cognitive components of reading, have not been tested with Latino children in the United States, one of the fastest growing and most at-risk student populations.

Language status. Finally, very few studies on the relationships between reading attitudes and reading comprehension have systematically contrasted first and second language learners. Katzir et al. (2009) meticulously excluded children with a limited English proficient designation from participation in the study, while Unrau and Schlackman (2006) sampled a large number of first- or second-generation Mexican and Asian immigrants without consideration for their level of oral language proficiency. (Students in English development classes were specifically excluded.) While Netten et al.'s (2011) study did specifically focus on presumed language differences, their sample of second language learners included only 93 primary school children in The Netherlands whose families had emigrated from the Mediterranean and former Dutch colonies. Such a sample may not be representative of Latino teenagers in the United States.

Building a Theory of Reading Comprehension Growth

In the empirical literature, the correlation between reading attitudes and reading amount is essentially ubiquitous (de Naeghel et al., 2012; Guthrie, Wigfield, Metsala, & Cox, 1999; Wigfield & Guthrie, 1997). Accordingly, educators and researchers have long assumed that the observed relationship between reading attitudes and reading comprehension growth is mediated by reading amount (Guthrie et al., 1999). That is, children like to read, they read more, and they become better readers. However, few researchers have also observed a relationship between reading frequency and reading comprehension (e.g., de Naeghel et al., 2012), and most mediational models have fallen

short of expectations (e.g., Becker et al., 2010; Wang and Guthrie, 2004), leading some to conclude that reading a lot is not necessarily associated with strong reading comprehension skills (de Naeghel et al., 2012; Schiefele et al., 2012).

The present study seeks to extend the literature by proposing a theory which centers on vocabulary as a key component of reading comprehension growth. Research reveals a strong correlation between vocabulary and reading comprehension (Olson et al., 2011; Verhoeven, van Leeuwe, & Vermeer, 2011), especially as children age and context clues play an increasingly important role in understanding. By sixth grade, vocabulary is the key predictor of reading comprehension (Verhoeven & van Leeuwe, 2008), and there is no indication that this trend reverses in later years (Cromley & Azevedo, 1997; Cromley et al., 2010). Limited research also emphasizes the especial importance of vocabulary acquisition for second language learners, suggesting that differences in their comprehension growth trajectory can be completely accounted for by initial differences in vocabulary (Lervag & Aukrust, 2010). This study will present a theory connecting reading attitudes with vocabulary development and then test this theory by determining whether, and under what conditions, these two variables are related.

Research Question 1

The first research question seeks to determine whether reading attitudes predicts Latino ninth graders' reading comprehension after controlling for language group, vocabulary, and word reading ability and, if so, whether this relationship depends on language group. Following related prior literature, these relationships will be investigated within a hierarchical regression framework. This research question is

premised on the theory that reading attitudes directly influences reading comprehension by affecting the reader's level of cognitive engagement.

Theoretical Justification of Variable Selection

In this section, justification is provided for the selection of two cognitive covariates along with an explanation of why these variables are appropriate for use with the population of interest (adolescent English learners). Since this population has not been adequately explored, the theoretical rationales will be based instead on research involving adolescent first language learners and elementary aged second language learners. Theoretical justification will also be provided for the inclusion of reading attitudes as a predictor in the model, as well as for the comparison of relationships between language groups.

Vocabulary as a covariate. According to the lexical quality hypothesis, the critical determinants of reading comprehension are word decoding and vocabulary, and both have been demonstrated to predict comprehension as well as comprehension growth over time (Verhoeven & van Leeuwe, 2008) among both first and second language learners (Lervag & Aukrust, 2010). This is consistent with the working memory view, which proposes that mental storage and processing functions trade off against each other (Baddeley & Hitch, 1974). The conscious decoding of unrecognized words places too much demand on working memory resources, as does excessive reliance on context to decipher multiple unfamiliar words. When these functions are not automatized, little cognitive desk space is available for higher order comprehension tasks.

Adolescent readers. In an early study by Hood and Dubert (1983), vocabulary was examined as a key predictor of ninth graders' reading comprehension. In another sample of U.S. ninth graders, reading comprehension scores were independently predicted by vocabulary knowledge after controlling for word decoding, listening comprehension, and reading speed (Tilstra et al., 2009). In 1997, Cromley and Azevedo constructed the direct and inferential mediation (DIME) model of reading comprehension, which used a structural equation modeling (SEM) framework to predict reading comprehension with strategy use, background knowledge, inferential abilities, vocabulary, and word reading. In a sample of ninth graders, vocabulary was the strongest predictor of reading achievement. In a follow-up study conducted with a sample of college freshmen, vocabulary persisted as a strong predictor of science text comprehension (Cromley et al., 2010).

English learners. Reading models for adolescent second language learners are essentially nonexistent, although several studies have confirmed the importance of vocabulary to second language learners in the primary grades. In a sample of fourth grade English learners, reading vocabulary predicted both listening comprehension as well as reading comprehension (Proctor et al., 2005). Among Spanish-speaking English learners, vocabulary and word reading ability in third grade accounted for 71% of the variance in reading comprehension in sixth grade (Nakamoto et al., 2008). And in a study of low-achieving Spanish-speaking 11-year-olds, vocabulary and word reading ability accounted for all unique variance in English reading comprehension outcomes (Mancilla-Martinez & Lesaux, 2010).

Some research suggests that vocabulary plays a more important role in the reading comprehension of second language learners than that of first language learners in elementary school (Lervag & Aukrust, 2010; Verhoeven, 2000). Droop and Verhoeven (2003) compared first- and second-language learners in Holland and discovered that second-language learners' listening comprehension was more highly dependent on their reading vocabulary knowledge.

Word reading ability as a covariate. Prior research suggests that word reading ability provides a useful control when seeking to isolate the relationship between reading attitudes and reading comprehension (Conlon et al., 2006; Katzir et al., 2009; Retelsdorf et al., 2011). Word reading ability should also be included as a covariate because poor reading fluency may contribute to a negative attitude toward reading. For example, children who lack fluency will take much longer to complete reading assignments in class, and they may experience embarrassment when reading out-loud. Controlling for word reading ability isolates the shared variation between reading attitudes and reading comprehension that cannot be explained by reading fluency deficits.

Adolescent readers. There is generally less emphasis on word reading ability in the secondary grades because, for the typically developing child, decoding skills eventually become automatized and fluency development levels off (Lervag & Aukrust, 2010). However, many children fail to attain proficiency, and word reading ability remains for them a significant predictor of reading comprehension. Thus, word reading ability continues to receive attention in the adolescent reading literature. In a study of Parisian seventh graders, Ehrlich, Kurtz-Costes, and Loridant (1993) found that word

recognition independently predicted reading comprehension for students of all ability levels, although it was the most important predictor for poor readers. Similarly, word decoding speed had a significant effect on reading comprehension among German 15-year-olds (Artelt, Schiefele, & Schneider, 2001). Samuelstuen and Braten (2005) found that word decoding independently predicted 22% of the variance in the reading comprehension scores of Norwegian tenth graders.

English learners. Prior research suggests that word reading ability is an important predictor of reading comprehension for elementary-aged second language learners. In a study of Dutch and immigrant children in The Netherlands, Verhoeven and van Leeuwe (2012) found that word decoding predicted reading comprehension for both first language and second language learners in the primary grades. Among Spanish-speaking English learners, word reading skills in third grade explained unique variance in reading comprehension in sixth grade, even after controlling for vocabulary (Nakamoto et al., 2008). And after controlling for reading vocabulary, phonetic ability remained a significant independent predictor of reading comprehension for English learners in fourth grade (Proctor et al., 2005).

Reading attitudes as a predictor. Several authors have provided causal explanations for the direct relationship between affective components of reading and reading comprehension. For example, LeDoux (1996) maintained that feelings and emotions have an impact on the activity of the prefrontal cortex, the area of the brain involved in working memory. He argued that a rapid negative emotional response can impair thinking and learning, while positive emotion can promote learning and

achievement. Ainley, Hidi, and Berndorff (2002) suggested a clear behavioral pathway between interest and reading comprehension when they found that eighth and ninth graders' level of interest in a given text produced an emotional response, and that the emotional response influenced their persistence with the text. Interested readers read all the way to the end, while disinterested readers stopped reading partway through.

Wang and Guthrie (2004) speculated that intrinsic motivation directly impacts reading comprehension by catalyzing the implicit use of effective reading strategies. Taboada et al. (2009) speculated that internally motivated readers have a desire to comprehend text, which energizes the use of reading strategies and other metacognitive processes. For example, motivated readers may be more likely to monitor their own understanding, reread when comprehension failure occurs, and visualize what they are reading, all of which have been demonstrated to improve comprehension (Dehn, 2008, pp. 293-294). In contrast, non-motivated readers may only pay attention to limited aspects of the text and are more likely rely on guessing and memorization when taking a reading test.

In order to produce evidence for a causal relationship, Guthrie et al. (2006) experimentally manipulated students' situational interest through the introduction of stimulating learning tasks related to the reading content. Students who participated in the associated learning tasks experienced improved comprehension of the respective texts, even after prior comprehension ability was statistically controlled. The authors concluded that interest increased motivation, which in turn promoted readers' engagement. de Naeghel et al. (2012) echoed this sentiment when suggesting that the

quality of reading engagement might be higher when children are reading for intrinsic reasons. Furthermore, after reviewing a large body of literature associating intrinsic reading motivation with diverse reading strategies, Schiefele et al. (2012) conclude that "it may be assumed that habitual reading motivation affects the quality of strategic processing while reading" (p. 447).

Comparisons between language groups. The children in this sample are homogeneous in respect to their age and (Latino) ethnicity, but they differ in their primary language, their level of English proficiency, and the timing of their attainment of English proficiency. Even though most of the children sampled spoke Spanish before they spoke English, it would be an oversimplification to label all of them English learners. Differentiating between specific types of second language learners is useful for both statistical and practical reasons. From a statistical standpoint, modeling individual language groups controls for a host of possible unidentified factors that are related to language group but which have not been included in the model. Practically speaking, this approach has the side benefit of helping to determine whether the school's classification system is having its desired effect. For example, a child who is initially designated fluent-English-proficient is believed to have the same language acquisition abilities as a native English speaker. Modeling these group differences helps determine whether that assumption actually holds up empirically.

Further insight can also be gained by observing whether language group variables change in the presence of additional variable sets. For example, as vocabulary and word reading ability covariates are added into the model, it is possible that main effects related

to second language learner status may reverse themselves. Some authors have found cognitive components of reading in the first language (L1) to predict reading comprehension outcomes in the second language (L2), even after controlling for parallel measures in L1 (Proctor, August, Carlo, & Snow, 2006). Similarly, after controlling for covariates in English, the redesignated students' Spanish language skills may prove to be of benefit to their English reading comprehension, thus producing a positive main effect. Such a finding would support the practice of assessing English learners' L1 skills in order to better predict their growth trajectory in English.

Finally, the explicit modeling of language groups answers a question of primary interest to this study, which is whether the relationship between reading attitudes and reading comprehension varies across language groups. Using precise, testable coefficients, it can be determined whether the strength of this association for each second language learner group is stronger, weaker, or equal to that of the English only students after controlling for vocabulary and word reading ability.

Research Question 2

The second research question seeks to determine whether reading attitudes predicts predicts Latino ninth graders' vocabulary after controlling for language group, prior achievement, and word reading ability and, if so, whether this relationship depends on language group. As with the first research question, this relationship will be investigated using a hierarchical regression analysis. This research question is based on the theory that readings attitudes and word reading ability work together to promote incidental vocabulary development.

Theoretical Justification of Variable Selection

Incidental vocabulary development refers to the natural and implicit acquisition of word knowledge which takes place during everyday encounters with academic and recreational texts. It represents up to a third of children's annual vocabulary growth (Nagy & Herman, 1987) and may be the primary contributor to individual differences in children's vocabularies (Vanhoeven & Perfetti, 2011). While this process occurs at a slow pace over an extended period of time, Nagy and Herman (1987) argue that a sufficient volume of wide reading will ultimately result in large-scale vocabulary development. Unfortunately, simply exposing children to print will not automatically guarantee an increase in their vocabularies. Incidental word learning depends on the reader's ability to use context clues (Swanborn & DeGlopper, 2002), which in turn depends on the child's ability to recognize and understand the surrounding words (Verhoeven et al., 2011). Furthermore, Guthrie et al. (2007) concluded that it is not the amount of reading that matters, but the depth and involvement of the reading process. In order to investigate the relationship between reading attitudes and vocabulary growth, it will first be necessary to control for existing differences in students' word reading abilities. At that point, it should be possible to detect an independent effect for reading attitudes. Comparisons between language groups will also be considered.

Word reading ability as a covariate. Incidental vocabulary development occurs when the meanings of new words are derived from context (Verhoeven et al., 2011). Children with small vocabularies struggle to comprehend the surrounding text, which prevents them from using context clues. Since unrecognized words are just as

troublesome as unfamiliar words (White, Graves, & Slater, 1990), students with poor word identification skills and word decoding skills are far less likely to build their vocabularies through incidental exposure (McKeown, 1985). Accordingly, low-ability readers should not be expected to dramatically expand their vocabularies simply by reading (Swanborn & DeGlopper, 2002). In contrast, superior word reading ability enables future vocabulary development by allowing readers access to more of their existing oral vocabularies. In fact, Nagy and Herman (1987) argue that, if children are given texts to read which are within the reach of their word reading abilities, they will almost certainly assimilate some knowledge about the meanings of some unfamiliar words.

Reading attitudes as a predictor. While learner characteristics, such as word reading ability, have been shown to impact the relationship between wide reading and vocabulary acquisition, this process is also influenced by the learner's purpose in reading (Swanborn & DeGlopper, 2002). If the child is not interested in understanding the material, unknown words will be summarily ignored. However, a child who approaches the reading task with a positive attitude will be more likely to examine unknown words in context in order to decipher their meanings. While little existing research has investigated a direct link between reading attitudes and vocabulary, there is some empirical support for the relationship. In a study of 697 third- through sixth-graders in urban and rural areas of Iowa, Roettger et al. (1979) found a significant correlation of .32 between reading attitudes and vocabulary scores. This finding is consistent with the theory that reading attitudes supports implicit vocabulary development.

Comparisons between language groups. As with Research Question 1, the inclusion of specific language group data provides numerous advantages. Language group comparisons are especially important in the case of the second research question because group differences are theorized to affect patterns of vocabulary development. For example, redesignated English learners may differ from English only students in their ability to transfer their Spanish word reading skills to English. One recent study found that predictors of bilingual students' word reading ability in English became nonsignificant after controlling for Spanish language variables (Leider, Proctor, Silverman, & Harring, 2013). Furthermore, non-redesignated English learners may have a much more difficult time translating positive reading attitudes into vocabulary development because of severe limitations in their word reading ability.

CHAPTER 3

Method

This chapter will provide detailed information about the participants, procedures, and measures used in the present study, including data on the reliability and validity of the selected instruments. The treatment of missing data and the use of weighting to correct for oversampling are discussed in detail. The results of a power analysis and an examination of potential issues related to collinearity are addressed as well. Both research questions will be approached using multi-step regression analyses with dummy coding applied to control for language groups. Expected outcomes are also discussed.

Participants

Population

Data for this study were acquired from a secondary data source provided by a large public high school in Los Angeles County. At the time of the study, the high school had a total enrollment of 2,501 (669 ninth graders). Of the school's entire student body, 92% were classified as Latino and 81% were eligible for free or reduced lunch. Participants were originally selected as part of a site-based reading study designed to monitor students' reading achievement over their freshmen year. The selection criteria for study were that the child (a) was currently enrolled in ninth grade, (b) contained state standardized testing data for at least one of the previous three years, and (c) was a typically developing child without recorded disability. Of the 669 ninth graders, 20 contained missing testing data and, of the remainder, 85 were classified as disabled. This resulted in an eligible population of 564.

Sampling Mechanism

In order to select students for the site-based reading study, students' English Language Arts scores on the California Standards Test (ELA CST) were averaged over the previous three years (sixth through eighth grades), and students were sorted by their average score. Students were then divided into two groups based on their average ELA CST score. Students with average scores below 315 (N = 184) were grouped together, and students with average scores of 315 or above (N = 380) were grouped together. A score of 315 corresponded roughly to the state-established cutoff point separating *basic* students from *below basic* students. Since the administration was primarily interested in the reading development of at-risk students, the children in the below basic group were deliberately oversampled. Of the 184 below basic students, 104 were randomly selected. Of the 380 basic or above students, 24 were randomly selected. This resulted in a total sample of 128.

Sample Characteristics

Participants were 128 ninth grade students (73 boys, 55 girls) between the ages of 13 and 15 (M = 13.87, SD = .53). Of the 128 students sampled, 96% were classified as Latino and 4% were classified as other than Latino. 24% of the students sampled were classified as English only (EO), 26% were classified as initial fluent-English-proficient (I-FEP), 21% were classified as "true" English learners, and 29% were former English learners who had been redesignated fluent-English-proficient (R-FEP). Language classifications were based on parent reports, academic performance, teacher evaluations, and standardized test scores.

Adjusting for Oversampling

Sampling weights (calculated as the inverse of the probability of being selected through the original sampling mechanism) were applied in order to create an unbiased probability sample of the school's population of ninth graders at the time the sample was obtained. Since low performing students had a higher chance of being selected than high performing students, weights were adjusted so that each ability group represented the same proportion of the final weighted sample as of the population (Winship & Radbill,

Figure 3.1

Average ELA CST Scores for Population, Unweighted Sample, and Weighted Sample

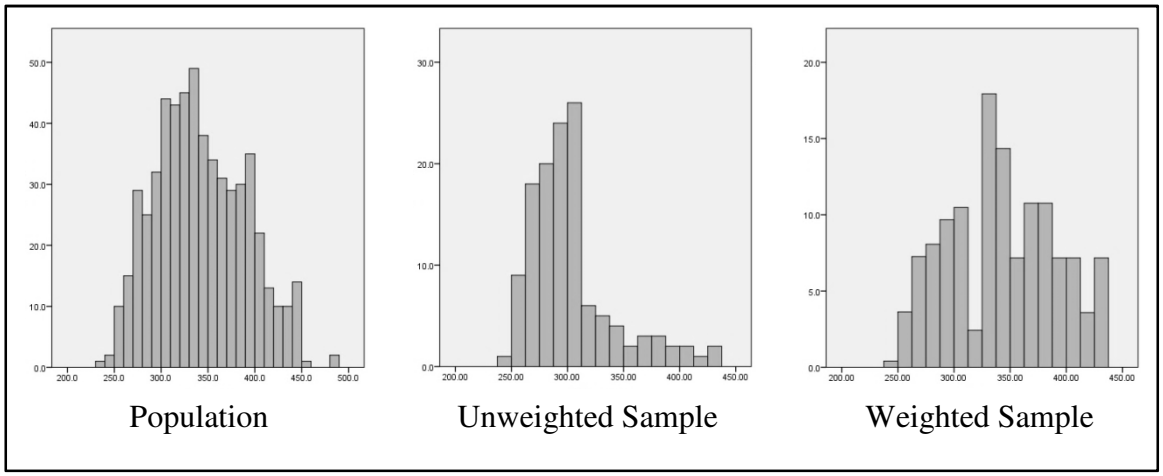


Table 3.1

Descriptive Statistics for Population, Unweighted Sample, and Weighted Sample

	Population	Unweighted Sample	Weighted Sample
M (*SD*)	342.17 (47.83)	302.79 (38.91)	343.06 (48.51)
Skewness (*SE*)	.29 (.10)	1.47 (.21)	.06 (.21)
Kurtosis (*SE*)	– .55 (.21)	2.04 (.43)	–.91 (.43)
N	565	128	128

1994). Below basic students were assigned a normalized weight of .40, and basic or above students were assigned a normalized weight of 3.59. After applying the weights, the sample closely approximated the population in respect to univariate descriptive statistics (see Table 3.1) and distributional shape (see Figure 3.1).

Data Collection

Individual- and group-administered reading-related tests were administered by school personnel during the beginning of the school year (Time 1). Identical tests were administered during the last month of the school year (Time 2). All of the assessments were administered in a typical standardized testing environment. Students were tested in two large groups in the school library away from distractions and under the supervision of the assistant principal. The resulting database was acquired from the school site for the purposes of secondary data analysis. Both university approval and permission from the school site were obtained, and all identifying student information was deleted before exporting the data.

Generalizability

The demographic of interest is Latino adolescents in the United States, particularly those who speak English as a second language (i.e., English learners). The dataset was selected for this study because it was considered representative of this demographic in respect to age, ethnicity, and language status. It is also important to note that, despite the sampling of a high-risk population, participant attrition was relatively low (5.6%). More importantly, the dataset includes a validated measure of students' reading attitudes, a construct central to the research questions posed here.

All of the participants were adolescents in ninth grade. Since there was very little variability in the students' ages, there was no apparent reason to suspect that age would moderate any of the results of the study. The results are expected to generalize to other ninth grade students within the same ethnic and linguistic demographics. The school from which the data were taken is in a low-income suburban community in Los Angeles County, and both the school (92%) and the city (80%) are overwhelmingly Latino. While no ethnic group is entirely homogenous in every respect, the results are expected to generalize to other Latino students living in the United States in low-income suburban communities.

Finally, the language subgroups represented in the sample were ideal for answering the research questions at hand. Of the students sampled, 24% spoke English as their first language, while 76% spoke English as a second language. 26% had been initially designated as fluent-English-proficient upon enrollment, 29% had later been redesignated fluent-English-proficient after a period of instruction, and the remaining 21% continued to receive specialized language instruction. Thus, students were quartered into four distinct and theoretically meaningful language groups.

Measures

Reading Comprehension

Reading comprehension was assessed using the Gates-MacGinitie reading comprehension subtest (Level 7/9, Form S; MacGinitie et al., 2001). The Gates-MacGinitie is a nationally-normed paper-and-pencil test of literal and inferential comprehension. The test includes 14 passages taken from published books and

periodicals that reflect the type of material students may encounter both in school and in recreational contexts. The Gates-MacGinitie reading comprehension subtest was a suitable dependent measure for this study because it reflects the type of content students are likely to encounter in the classroom. The length of the test yields high reliability, and the questions increase in difficulty as the test progresses. The advantage of this second attribute is that lower performing students who fatigue during the test will only miss the questions at the end of the test which they were unlikely to answer correctly anyway.

Elsewhere in the literature, the Gates-MacGinitie reading comprehension subtest has demonstrated high internal reliability. Cromley and Azevedo (2007) reported a Cronbach's alpha coefficient of .94 (equivalent to a Kuder-Richardson 20 ($K\text{-}R_{20}$) reliability coefficient of .94) for a similar sample of ninth grade students. This was slightly higher than the $K\text{-}R_{20}$ reliability coefficients of .91-.93 previously reported by MacGinitie, MacGinitie, Maria, and Deyer (2002) with a sample of seventh- through ninth-grade students. Acceptable reliability was likewise obtained in the present study, with a $K\text{-}R_{20}$ coefficient of .85 at Time 1 and a $K\text{-}R_{20}$ of .89 at Time 2.

Vocabulary

Vocabulary was measured using the corresponding Gates-MacGinitie vocabulary subtest (Level 7/9, Form S; MacGinitie et al., 2001) consisting of 45 items. In this test, each word is presented in a brief context designed to imply part of speech but not to provide clues to meaning. Students must select the word or phrase that means most nearly the same as the test word. There are five different answers, reducing the likelihood of examinees guessing the correct answer.

Cromley and Azevedo (2007) reported a Cronbach's alpha internal reliability coefficient of .88 (equivalent to a K-R_{20} coefficient of .88) with a ninth grade sample. This was somewhat lower than the test author's reported K-R_{20} reliability coefficients of .91-.93 with a seventh- through ninth-grade sample. In the present study, the vocabulary subtest produced K-R_{20} coefficients of .83 at Time 1 and .87 at Time 2, both adequate for psychometric purposes.

Word Reading Ability

The dataset includes three different measures of word reading ability which were individually administered by a credentialed high school English teacher. These included the Letter-Word Identification and Word Attack subtests of the Woodcock Diagnostic Reading Battery (Woodcock, 1997) and a one-minute timed reading task. The Letter-Word Identification subtest is a measure of word recognition skills which requires students to pronounce an increasingly difficult list of words until a predetermined ceiling is reached. The Word Attack subtest is similar in format and assesses word decoding skills. In this test, the students must pronounce nonsense words of increasing difficulty. The passage for the one-minute timed reading was taken from *Basic Reading Inventory* (Johns, 2008), an informal reading inventory used by educational practitioners to estimate students' independent and instructional reading levels. This expository passage about the destruction of Pompeii was written at the ninth grade reading level. Scores are calculated by counting the number of words the student reads in one minute and then subtracting the number of words pronounced incorrectly. The difference is commonly referred to in the

literature as "words correct per minute" (WC/M) and is considered a measure of reading fluency.

These measures have been used extensively in prior research, although primarily with younger children. WC/M is commonly used to measure learning or growth rates within subjects, and it has been shown to account for more than 30% of the reading composite score variance in 4th-, 5th-, and 10th graders (Williams et al., 2011). The two Woodcock word reading tasks have also been used in studies involving secondary students with reading difficulties (e.g., Benner, Nelson, Stage, & Ralston, 2011), as well as in a study of ninth graders' reading comprehension (Cromley & Azevedo, 2007), where small but significant effects were found for word reading skills on reading comprehension.

Preliminary analyses. Among students sampled, word recognition skills and word decoding skills were highly correlated at both time points. This raised the concern that collinearity between these two independent variables would produce problems with interpretation, sampling stability, and computational accuracy (Cohen & Cohen, 1983, p. 115-116). In order to address this issue, some researchers have combined word reading ability measures to create composite or factor scores (e.g., Cromley & Azevedo, 2007; Nakamoto et al., 2008). However, in the present case, correlation analyses suggested that the relative importance of different word reading ability measures may vary between language groups and that the creation of a factor score would be inappropriate. Since word recognition skills was more highly correlated with the dependent variables than was word decoding skills, word decoding skills was omitted from further analyses. Reading

fluency and word recognition skills were retained as separate measures to represent word reading ability. According to Cohen and Cohen (1983, p. 171), it is better to exclude peripheral and redundant variables from a multiple regression model in order to increase statistical test validity, statistical power, and clarity in interpretation. A comprehensive treatment of collinearity issues in the present study is provided later in this chapter.

Reading Attitudes

Reading attitudes was measured using a modified version of the Elementary Reading Attitudes Survey (ERAS; McKenna & Kear, 1990), which has been used extensively in the reading research literature (e.g., Allen, Cipielewski, & Stanovich, 1992; Diamond & Onwuegbuzie, 2001; Kazelskis, Thames, & Reeves, 2004; Kush & Watkins, 1996; Worrell, Roth, & Gabelko, 2007). The ERAS is a nationally-normed public-domain reading survey designed to "enable teachers to estimate [students' reading] attitude levels efficiently and reliably" (p. 626). The instrument was standardized with a sample of over 18,000 students in Grades 1-6 from 95 school districts in 38 states. The survey asks participants to respond to a series of 20 statements using a four-point scale. In addition to a combined score (ERAS-C), the instrument includes two subscales, one measuring attitude toward academic reading (ERAS-A) with statements such as, "How do you feel about learning from a book?" and another measuring attitude toward recreational reading (ERAS-R) with statements such as, "How do you feel about reading during summer vacation?"

Originally designed for young children, the ERAS uses a pictorial Likert-type scale with four cartoon characters with an extremely happy expression on one end and a

seemingly upset expression on the other. Smith and Ryan (1997) developed an alternate form of the ERAS which replaced the cartoon images with written descriptions (e.g., 4 = *makes you very happy*). Although the non-pictorial version functioned slightly differently from the original, it has since been adopted as a more age-appropriate assessment for older children (e.g., Birmingham, 2001) because older children may interpret the cartoons as patronizing (Smith & Ryan, 1997). In the present study, this modified version was reduced in length from 20 items to 10 items (5 items for each subscale) for easier inclusion in a lengthy testing battery (see Appendix). The reduction in items was deemed tenable because reading attitudes tend to stabilize with age (McKenna & Kear, 1990), meaning that the instrument will need less items to produce high internal consistency when used with older children, and because both ERAS subscales have demonstrated high split-half reliability (Allen et al., 1992).

Reliability and validity. Because the ERAS was being adopted for use with a different population, it was important to determine whether the factor structure of the instrument was the same for adolescents as for elementary aged children, particularly whether the distinction between academic and recreational reading attitudes holds for ninth grade students. A confirmatory factor analysis demonstrated a good fit between the intended two-factor model and the observed data, as indicated by the comparative fit index (CFI) = .96, the Tucker-Lewis fit index (TLI) = .95, and the RMSEA = .07.

The Cronbach's alpha coefficients for both subscales and for the composite score ranged from .74 to .89 on the normative sample (Grades 1 through 6), and a number of studies have associated ERAS scores with reading outcomes for primary-grade children.

Data collected in the present study were analyzed at both Time 1 and Time 2 to determine whether the instrument was reliable and valid for use with an adolescent Latino population. At Time 1, the ERAS-A subscale had an alpha coefficient of .78, while the reliability of the ERAS-R was .87. The intersubscale correlation was .60, which was consistent with the intersubscale correlation of .62 reported by Kush and Watkins (1996) and similar to the intersubscale correlation of .64 reported for the normative sample. At Time 2, the ERAS-A subscale had an alpha coefficient of .78, and the reliability of the ERAS-R was .88. The intersubscale correlation was .63. Thus, the modified ERAS used in this study functioned similarly and as reliably as the original instrument, despite the change in format, length, and sample demographics.

Data analysis at Time 1 also provided convergent validity evidence for the use of the ERAS with an adolescent Latino population. At Time 1, all three ERAS scales were positively correlated with both reading comprehension and vocabulary with significant correlations ranging from .21 to .35 for the total sample. There was also a significant correlation between the ERAS-C at Time 1 and the English Language Arts California Standards Test (ELA CST) for grade 8, $r(121) = .27$, $p < .01$. Given the normal distribution of scores on each ERAS subscale, the reliable and consistent performance of each subscale, and the significant correlations between subscale values and related constructs, the use of this instrument with the population of interest is supported.

ERAS subscale selection. Reading motivation research makes a distinction between autonomous motivation and external motivation (de Naeghel et al., 2012). Autonomously motivated children read for enjoyment, while externally motivated readers

read to obtain a reward. While autonomous motivation has been found to predict reading engagement and reading frequency, controlled motivation has no influence on reading engagement and negatively predicts reading comprehension. An analogous dichotomy has been observed with the ERAS subscales. Nellenbach (2010) found that the ERAS-R was more highly correlated with reading comprehension, $r(58) = .48$, $p < .001$, than was ERAS-A, $r(58) = .35$, $p < .01$. After controlling for cognitive covariates, only the ERAS-R independently predicted students' reading comprehension scores. At first, it may seem odd that the recreational reading subscale would predict scores on a reading test given in school, while the academic reading subscale does not. However, a closer inspection of the individual items yields a possible explanation.

The recreational subscale of the ERAS includes items such as *How do you feel about reading for fun at home?* and *How do you feel about going to a bookstore?* These items are conceptually very similar to the items indicating autonomous reading motivation in the de Naeghel et al. (2012) study. For instance, indicators of autonomous reading motivation include items such as *I read in my free time because I enjoy reading* and *I read for school because it's fun to read.* Thus, both of these scales may be tapping the same basic affective response. This should not be surprising in light of Conradi's (2011) study finding substantial shared variance among three different reading-related affective measures.

There also appears to be subtle similarity between the academic reading attitudes subscale and measures of external reading motivation. The academic subscale of the ERAS asks *How do you feel when you read out loud in class?* and *How do you feel about*

taking a reading test? Indicators of external reading motivation include *I want others to think I am a good reader* and *I have to prove to myself that I can get good reading grades.* It is possible that children who like to read out loud in class do so because they want others to think that they are good readers. Likewise, children who like taking reading tests may do so because they want to prove that they can get good reading grades.

Preliminary analyses. Preliminary analyses were conducted to determine whether the ERAS-A or the ERAS-R would be a better predictor of students' reading comprehension and vocabulary. Among students sampled, the ERAS-A was uncorrelated with reading comprehension at either time point. There was a weak correlation between the ERAS-A and vocabulary at Time 1, but they were not correlated at Time 2. In contrast, the ERAS-R was significantly correlated with both reading comprehension and vocabulary at both time points. Therefore, in light of prior research, motivation theory, and preliminary analyses, the ERAS-R was selected to represent reading attitudes in subsequent analyses.

Analytic Method

Statistical Software

Raw data from the school district were provided in Microsoft Excel format. These were then converted to SPSS format for analysis. Data grooming, missing data imputation, descriptive statistics, correlation tests, calculation of reliability coefficients, and multiple regression analyses were conducted using IBM SPSS Statistics Version 21. Confirmatory factor analysis was conducted using M*plus* Version 6.11 (Muthén & Muthén, 2011).

Missing Data

Participants with missing data on the dependent variable for a given model were omitted from the respective analysis. This resulted in a small number of participants (4.8%) with missing data on one or more word reading ability measures. These missing values were imputed using the expectation maximization (EM) algorithm. A simulation was conducted in which eleven word reading measures were randomly deleted and missing values were imputed using EM. This resulted in a correlation of .89 between the imputed values and the actual missing values. Thus, EM was deemed to be a tenable approach for replacing the missing data in the present study.

Statistical Technique

Hierarchical regression analysis (HRA) is a useful and popular tool for extracting additional information from a data set (Cohen & Cohen, 1983, p. 120). In an HRA, *k* independent variables (IVs) are entered cumulatively in a predetermined sequence and the amount of variance explained (R^2) is evaluated as each IV joins the others. The order (hierarchy) of the IVs is decided beforehand and is determined by the logic and purpose of the research. This is important because the amount of variance attributed to each IV will change based on its position in the equation. Causal priority is generally granted to status variables, such as age, sex, and ethnicity, because they are unlikely to be affected by other variables in the equation. The hierarchy may also be determined by structural considerations, such as the representation of an interaction. Finally, considerations of research relevance typically place variables with exploratory relationships at later stages in the model.

HRA was selected for use in the present study because it allows each research question to be answered directly. The first research question asks whether reading attitudes will predict reading comprehension after controlling for language group, vocabulary, and word reading ability and, if so, whether this relationship depends on language group. By entering these variables in a predetermined order, HRA can be used to determine the proportion of variance that can be explained by reading attitudes above and beyond that explained by vocabulary and word reading ability. The second research question asks whether reading attitudes predicts vocabulary after controlling for language group, prior achievement, and word reading ability and, if so, whether this relationship depends on language group. The use of HRA will allow the evaluation of the explanatory power of each IV independently in addition to modeling a potential interaction effect. Status variables related to language group can be included early in each analysis in order to determine whether these relationships vary between language groups. Furthermore, HRA is appropriate for use in the present study because it does not make causal demands, in contrast to path analysis and structural equation modeling.

It should also be noted that a precedent for the use of HRA exists within the related reading attitudes literature. For example, Conlon et al. (2006) used HRA to isolate the effect of reading attitudes on reading comprehension after controlling for status variables and various cognitive variables. A similar approach was applied by Katzir et al. (2009) to a relatively small sample (n = 67) of fourth grade children when the authors sought to isolate the impact of affective components of reading after controlling for status variables, vocabulary, and word reading ability. The latter also exemplifies

HRA's forgiving attitude toward small sample sizes, a highly desirable attribute in the case of the present study.

Assumptions. The assumptions of HRA are similar to ordinary least squares (OLS) regression and include (a) independence of observations, (b) normally distributed error terms, (c) homoscedasticity of variance, and (d) linearity between each independent variable and the dependent variable (Cohen & Cohen, 1983, p. 125-130). Independence means that the observations are not influenced by an outside factor common to several of the observations. Normality means that residuals are approximately normally distributed with minimal outliers (extreme positive or negative residuals which are at least three standard deviations away from the mean). Homoscedasticity means that the scatter of residuals is constant over the range of $\hat{Y}$ values, and linearity means that there is an approximately uniform band of both positive and negative residuals extending across low to high values of $\hat{Y}$.

Normality can be tested graphically as well as through the use of formal statistical tests, such as the Shapiro-Wilks test. Outliers, or extreme residuals, constitute a threat to normality when they are predominantly of the same sign exerting a strong pull on the regression. When outliers are few in number (less than 2% of n) and not very extreme, it is generally best to leave them alone (Cohen & Cohen, 1983, p. 128). The remaining assumptions are generally tested by plotting the n residuals (the n values of $Y - \hat{Y}$) against the predicted values of $\hat{Y}$ on a graph. Heteroscedasticity can be detected visually by observing an inconstant scatter of residuals along the range of $\hat{Y}$ values. Finally, if the negative residuals occur mainly at low and high ends of $\hat{Y}$, while the positive residuals

occur mostly in the middle, a curvilinear relationship is indicated (p. 126). This issue can be resolved by isolating the source of the curvilinearity and making provision for it in the regression model.

Power analysis. Statistical power refers to the probability of rejecting a false null hypothesis for a particular effect size. Social science researchers have generally adopted Cohen's recommendation of .80 as the minimum power necessary before an investigation should be undertaken (Aiken & West, 1991, p. 156). Since statistical power is partially a function of sample size, this means that the sample must be large enough to produce an 80% chance of detecting an effect of a particular size. These are ballpark estimates (p. 160), and prior literature is frequently relied upon for producing effect size estimates (Cohen & Cohen, 1983, p. 155).

Effect size. Effect size is calculated differently based on the statistical test being performed. When the amount of variance explained by a variable or variable set is the outcome of interest (as in the case of the present study), Cohen's f^2 is often the preferred approach (Aiken & West, 1991, p. 157). In this framework, effect size is defined as the amount of systematic variance accounted for by the effect proportionate to unexplained variance in the dependent variable as defined by the equation:

$$f^2 = \frac{{R^2}_{AB} - {R^2}_{A}}{1 - {R^2}_{AB}} \tag{3.1}$$

where ${R^2}_{A}$ is the variance accounted for by a set of one or more independent variables *A*, and ${R^2}_{AB}$ is the combined variance accounted for by *A* and another set of one or more independent variables *B*. According to Cohen's criteria, an effect size of .02 is

considered small, .15 is considered medium, and .35 is considered large. Power analyses were conducted separately for each research question.

Research question 1. In order to generate a ballpark estimate of the total expected R^2, two relevant prior studies were consulted. Samuelstuen and Braten (2005) predicted tenth graders' reading comprehension using decoding, topic knowledge, and strategy use and produced a total R^2 of .53. Cromley and Azevedo's (2007) study of ninth graders' reading comprehension generated a total R^2 of .66 using vocabulary, word reading ability, and various measures of strategy use. For the purposes of the power analysis, these values were averaged to produce an estimated R^2 of .60.

To produce an estimate of the amount of variance explained by reading attitudes, Petscher's (2010) meta-analysis of 32 studies investigating the correlation between reading attitudes and reading achievement was consulted. Results indicated that the average strength of the relationship is moderate (Z_r = .32), although higher for students in elementary school (Z_r = .44) and lower for students in middle school (Z_r = .24). The most conservative of these estimates, corresponding to an R^2 of approximately .06, was selected for the purposes of the power analysis.

Applying Eq. (3.1),

$$f^2 = \frac{.66 - .60}{1 - .66} = \frac{.06}{.34} = .18$$

these selected values produced an estimated effect size of .18, or a medium effect.

Required sample size. The following equation can be used to determine the number of cases required to have the specific power (.80) at the α level of significance (in this case, .05) when f^2 is posited to be .18:

$$n^* = \frac{L}{f^2} + k + 1 \quad (3.2)$$

where n^* is the necessary number of cases, *L* is the power value for the selected α level and desired power, and *k* is the total number of independent variables. Substituting the appropriate values produces the equation:

$$n^* = \frac{7.85}{.18} + 7 + 1 = 43.61 + 7 + 1 = 52.$$

This indicates that, under the assumptions dictated above, a sample size of 52 is required to detect a main effect for reading attitudes after partialling out the variance attributed to language group, vocabulary, and word reading ability.

Power to detect an interaction. After investigating main effects for reading attitudes, interaction effects will be tested by introducing a set of three cross-product variables. The process described above can be reversed in order to estimate how large the effect size of the hypothetical interaction would need to be in order to be detected at a power of .80 and α of .05. The number of required cases for a power analysis of a set of variables is determined using the formula:

$$n^* = \frac{L}{f^2} + k_A + k_B + 1 \quad (3.3)$$

where set *B* contains the variables to be considered over and above that accounted for by set *A*. At Time 2, the data set contains 120 complete cases. Therefore, this sample size will be substituted for n^*. k_A is 7, k_B is 3, and *L* is 10.90 (k_B = 3, power = .80, α = .05). Solving for f^2 produces a minimum effect size of .10. Substituting this value back into the formula for f^2 produces an $R^2{}_B$ of .03. In other words, the combined interaction

terms must explain at least an additional 3% of the variation in reading comprehension in order to be detected with a power of .80 at an α level of .05.

Research question 2. In order to conduct a power analysis for the second research question, it was first necessary to estimate the amount of variation that will be explained by the model before the inclusion of reading attitudes. While models of vocabulary development are scarce, two related studies were identified which autoregressed children's reading comprehension on measures of their prior achievement. Taboada et al. (2009) found that fourth graders' reading comprehension in September explained 56% of the variation in reading comprehension the following December. In a later study of children aged 9-11, previous reading comprehension explained 68% of the variation in current reading comprehension nine months later (Logan, Medford, & Hughes, 2011). These studies were determined to be instructive because of the close relationship between reading comprehension and vocabulary. The larger of these coefficients (.68) was selected as the predicted R^2 for use in the subsequent power analysis. This selection was nonetheless considered conservative because the model will include additional predictors, including language group and word reading ability, and because reading abilities stabilize with age.

Required effect size. As before, a power of .80 and an α of .05 were selected for the power analysis. Since 118 students contained complete data at both time points, this sample size was substituted for n^* to produce the equation:

$$118 = \frac{7.85}{f^2} + 7 + 1.$$

Solving for f^2, it can be determined that an effect size of at least .07 is required in order to detect a main effect for reading attitudes. Substituting this value back into the formula for f^2 produces an R^2_B of .02. This means that the model should correctly detect a main effect if reading attitudes explains at least 2% of the variation in vocabulary at Time 2.

Power to detect an interaction. As before, three interaction terms will be added in the last step of the regression in order to determine whether the effect of reading attitudes on vocabulary development differs by language groups. The number of required cases for a power analysis of a set of variables is again determined using Eq. (3.3). Since 118 students contained complete data at both time points, the sample size will be set to 118. k_A is 7, k_B is 3, and L is 10.90 (k_B = 3, power = .80, α = .05). Solving for f^2 produces a minimum effect size of .10. If a ΔR^2 of .02 is assumed for the main effect of reading attitudes, substituting this value back into the formula for f^2 produces an R^2_B of .03, meaning that the interaction terms must explain at least an additional 3% of the variation in order to be detected with .80 power at α .05.

Conclusions. For the first research question, it was determined that the sample size would be more than adequate to detect a main effect for reading attitudes comparable to the effects evidenced in the literature. However, the model was only expected to detect an interaction with an effect size of .10 or above, corresponding to a ΔR^2 of .03. Since an effect size of .15 is considered to be a medium effect, it could be argued that an effect too small to be detected is unlikely to be of any substantive importance anyway. In respect to the second research question, a large total R^2 would provide greater power to detect small effects. A main effect for reading attitudes would only need to explain an

additional 2% of the variance in vocabulary in order to be detected with a power of .80. Retaining this number as a conservative estimate, analyses revealed that the interaction set in the second research question would require an effect size of .10, corresponding roughly to a medium effect. Again, any effects too small to achieve statistical significance would also likely be too small to be of any practical significance, indicating that there was enough statistical power to proceed with the study.

Sampling weights and regression analysis. Just as the use of sampling weights produces covariance and variance estimates that are unbiased and consistent with population estimates, the regression estimates for the weighted sample also provide consistent and unbiased estimates of the regression model for the whole population (Winship & Radbill, 1994). This procedure is referred to as weighted ordinary least squares (WOLS) regression. While typically unnecessary when sampling weights are a function of independent variables, WOLS is required when sampling weights are a function of the dependent variable, and the weights are correcting for sample selection bias, as in the case of the present study. In this situation, WOLS will provide consistent estimates of the true regression slopes. One disadvantage of WOLS is that, if the residuals of the unweighted sample are homoscedastic (as OLS assumes), the use of sampling weights will produce heteroscedasticity. However, White's (1980) heteroskedastic consistent estimator can be used to correct the standard errors of the coefficients.

Collinearity. Collinearity exists when there are high correlations between predictor variables, leading to unstable or unreliable estimates of regression coefficients

(Cohen & Cohen, 1983, p. 115-116). Fortunately, preliminary correlational analyses revealed that reading attitudes, the independent variable of principal interest to the present study, enjoyed only low to moderate correlations with the other independent variables under consideration. However, high correlations among the other independent variables were likely to crop up in the present study because of strong relationships between control variables, the inclusion of cross-product interaction terms, and the use of dummy variables to represent a categorical variable with more than two categories.

Even after omitting Word Decoding Skills from the analysis, significant correlations between the remaining cognitive covariates were expected. However, based on preliminary correlational analyses, it appeared unlikely that these relationships would be problematic. Furthermore, the cognitive covariates are not of substantive interest in of themselves, and it is not essential that their coefficients be clearly interpretable. Finally, in a multiple regression framework, interactions are modeled by multiplying the two terms in the theorized interaction. Certainly cross-product terms will be highly correlated with their component variables. Fortunately, this is not of concern because the *p*-value for the product term is not affected by the collinearity and the R^2 will be the same in either case, meaning that the collinearity has no adverse consequences (Allison, 2012).

Research Question 1

The first research question is whether reading attitudes predicts Latino ninth graders' reading comprehension after controlling for language group, vocabulary, and word reading ability and, if so, whether this relationship depends on language group. The research question is premised on the theory that reading attitudes catalyzes implicit

behaviors that improve reading comprehension, even after taking into consideration relevant background characteristics, such as language proficiency. The intention of this statistical model is to isolate the influence of reading attitudes by controlling for cognitive components of reading. This is similar to the approach taken by Katzir et al. (2009), Logan et al., (2011), Swalander and Taube (2007), and Taboada et al. (2009), as well as by other authors seeking to build a model of reading comprehension at a single point in time irrespective of affective components (e.g., Cromley & Azevedo, 2007; Samuelstuen & Braten, 2005). The problem with this type of approach is that there may be any number of unknown or unmeasured variables influencing reading comprehension that may also be associated with reading attitudes. Thus, there exists the risk to internal validity that an observed relationship between reading attitudes and reading comprehension could simply be spurious.

One strategy for resolving this difficulty would be to control for prior reading comprehension achievement. This would have the benefit of controlling for an infinite number of unknown or unmeasured cognitive covariates. The downside of this approach is that it would also control for any variation associated with reading attitudes that influences reading comprehension at both time points. Since reading attitudes is understood to be a relatively stable construct over time, an advantage gleaned at Time 2 would also likely have been evidenced at Time 1. Thus, controlling for reading comprehension at Time 1 would make it difficult to detect the effects associated with reading attitudes at Time 2.

The use of a more advanced statistical technique, such as path analysis, would resolve this difficulty by allowing reading comprehension at *both* time points to be regressed on reading attitudes. Unfortunately, sample size limitations in the present study restrict the analytic approach to a univariate regression. Since the multiple regression framework does not allow for the specification of multiple dependent variables, the inclusion of prior achievement necessarily changes the interpretation of each covariate's respective coefficient. If a significant effect were detected at Time 2, this would be more properly interpreted as a predictor of change in reading comprehension ability. While substantively interesting, this research question seeks to address whether positive reading attitudes may help to maximize a student's existing cognitive resources, not whether it increases those resources over time.

Therefore, it was determined not to include prior reading comprehension as a covariate. Instead, a number of research-based cognitive covariates were included as control variables, as well as language group data. The benefit of controlling for main effects associated with language group is that this may account for additional unmeasured differences between students, such as disparities in their instructional programs and additional language dimensions assessed by the school but not included in the study. Accordingly, this research question will be addressed using an HRA with four distinct steps. The first will model language group differences, the second will control for cognitive covariates, the third will introduce reading attitudes, and the last will explicitly test for interactions between reading attitudes and language groups. Each step of the analysis will provide the increase in Y variance accounted for by the new variable(s)

entered at that point above and beyond that which has already been accounted for by the prior IVs (Cohen & Cohen, 1983, p. 120).

Step 1. Language group will be entered into the model at Step 1 in order to investigate mean differences in reading comprehension between language subgroups. Language group has causal priority in the model because it is temporally prior and unlikely to be affected by the other IVs (Cohen & Cohen, 1983, p. 121). Since there is no logical approach for ordering the language groups (a student who speaks only English is not "more" or "less" than a student who also speaks some Spanish), and since there are four different language subgroups, language group constitutes a nominal scale with four distinct categories or groups ($g = 4$). In order to quantify these data in a regression analysis, the full representation of information contained in the language group variable requires a set of 3 ($g - 1$) IVs.

There are three primary methods for representing a nominal scale within a multiple regression framework, including dummy-variable coding, effects coding, and contrast coding, each with its own strengths and weaknesses (Cohen & Cohen, 1983, p. 182). When the interaction involves a categorical variable (e.g., language group) and a continuous variable (e.g., reading attitudes), Aiken and West (1991, p. 129) recommend the use of dummy coding, as it provides easily interpretable contrasts with the reference group, whereas effects coding does not. However, the selection of a coding system must be based on its appropriateness for the question at hand, as different approaches produce results that reflect their different meanings.

Dummy coding is a suitable approach when one of the groups provides a theoretically meaningful "control" against which each of the other groups can be compared. In the present study, we are chiefly interested in the comparison between English only students and English learners. However, English learners have been further classified according to state and federal guidelines into three distinct subgroups based on whether and when they attained English language proficiency comparable to that of a native English speaker. Since the experiences and characteristics of these three English learner groups may vary greatly, it would be risky and unnecessary to combine any of the groups for the purpose of analysis. Instead, dummy coding allows English only students to serve as the reference group against which each of the other three English learner groups may be individually compared (just as they are in real life). Therefore, dummy variable coding was selected to represent the four language groups of interest. Table 3.2 provides dummy variable codes for each language group. The coding coefficients for the four language subgroups will be entered as a structural set representing a single research factor, since dummy codes are partial effects conditioned on all $g - 1$ variables being present in the regression model (Aiken & West, 1991, p. 117).

The first dummy variable (D_1) will contrast English only students with students who were initially designated fluent-English-proficient. This coefficient will determine whether there is a significant difference in the mean reading comprehension scores of these two groups. Since I-FEP children were classified as such under the assumption that their language skills were on par with English only children, no main effect should be present. Next, D_2 will compare the average reading comprehension scores of English

Table 3.2
Dummy Variable Coding System for Language Group with g = 4 Categories

G_i	Language Group	D_1	D_2	D_3
G_1	EO	0	0	0
G_2	I-FEP	1	0	0
G_3	EL	0	1	0
G_4	R-FEP	0	0	1

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.

only children with those of the "true" EL children. Since the latter have not yet achieved proficiency in English, this contrast should produce a significant negative coefficient. Finally, D_3 will compare English only children to English learners who have since been reclassified fluent-English-proficient. Since R-FEP students are expected to demonstrate the same level of English language proficiency as English only students, this coefficient should be non-significant. The presence of a main effect for either D_1 or D_3 would have policy implications because it would suggest that these students are not developing identically to their English only peers and, consequently, may have been improperly classified.

All three language group dummy variables will be entered into the model at the same time as a set, yielding the following equation:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + e,$$

where b_1–b_3 provide the significance tests for each of the three between-group contrasts. It is important to note that the interpretation of these variables, as well as their coefficients, will change as additional variable sets are added to the model. In the presence of covariates, each dummy variable will represent the mean difference between English only children and the respective language group *controlling for* the other independent variables in the equation.

Step 2. The next step of the HRA will control for the confounding influences of vocabulary and word reading ability. According to Cohen and Cohen (1983, p. 121), it is frequently not possible to propose a single sequence of variables that is uncontroversially in order of causal priority. Therefore, the control variables will be ordered according to their relative support in the existing literature. Vocabulary will be considered first because, in most studies, the association between vocabulary and reading comprehension is much stronger than that of word reading ability and reading comprehension (Olson et al., 2011; Verhoeven et al., 2011), especially as children get older (Verhoeven & van Leeuwe, 2008; Yovanoff, Duesbery, Alonzo, & Tindal, 2005). This is partly due to the increased role of context in creating meaning from text. In the later stages of reading development, children with a wider vocabulary are better able to infer meanings of unfamiliar words as they are encountered (Aarnoutse & van Leeuwe, 1988; Bast, 1995). By sixth grade, vocabulary becomes the key predictor of children's reading comprehension (Verhoeven & van Leeuwe, 2008).

Word reading ability measures are also included as cognitive covariates in Step 2 in order to control for the confounding relationship they may have with reading attitudes.

For some children, poor word reading ability may contribute to a negative attitude toward reading. Children with poor word reading ability will take much longer to complete reading assignments in class, and they may experience embarrassment when reading out-loud. By controlling for word reading ability, it is possible to better isolate the shared variation between reading attitudes and reading comprehension that cannot be explained by word reading ability deficits. At Step 2, the two most relevant word reading ability measures, word recognition skills and reading fluency, will be entered into the model along with vocabulary to produce the equation:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + b_4X_1 + b_5X_2 + b_6X_3 + e,$$

where b_4 is the coefficient estimate for the unique effect of vocabulary on reading comprehension, b_5 is the coefficient estimate for the unique effect of word recognition skills, and b_6 represents the unique effect of reading fluency. The change in R^2 (or ΔR^2) at Step 2 will represent the incremental variance accounted for by the cognitive covariates over and above that explained by language group.

Step 3. In the third step, reading attitudes will be added to the model:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + b_4X_1 + b_5X_2 + b_6X_3 + b_7X_4 + e,$$

where b_7 is the coefficient estimate for the unique effect of reading attitudes on reading comprehension. This coefficient provides a direct test of the first part of the first research question because differences associated with language group and potentially confounding cognitive covariates have now been controlled. If the beta coefficient associated with reading attitudes is significant, then it can be concluded that reading attitudes independently predicts reading comprehension. Given the limitations of the study and

the correlational nature of the data, it will not be possible to conclude whether reading attitudes actually *causes* reading comprehension. However, a significant positive coefficient would be consistent with that supposition. Furthermore, the ΔR^2 at Step 3 will provide a clue as to the practical significance of this relationship.

Step 4. Finally, in order to test the second half of the first research question, the slopes representing the relationship between reading attitudes and reading comprehension will be permitted to differ among language groups. Under this scenario, the regression lines are not parallel, suggesting an interaction between language group and reading attitudes. This interaction is formed algebraically by multiplying the reading attitude score by each of the three dummy variables representing language group (Aiken & West, 1991, p. 123). Thus, three new interaction terms are added to the model:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + b_4X_1 + b_5X_2 + b_6X_3 + b_7X_4 + b_8(D_1 \times X_4) + b_9(D_2 \times X_4) + b_{10}(D_3 \times X_4) + e,$$

where b_8 represents the difference in the regression of reading comprehension on reading attitudes between English only students and I-FEP students, b_9 is the difference in the regression lines of English only students and "true" EL students, and b_{10} is the difference in the regression lines of English only students and R-FEP students. If one of these coefficients is significant, it indicates that the effect of reading attitudes on reading comprehension differs between English only children and the respective second language learner group, even after controlling for vocabulary and word reading ability. If each of these coefficients is nonsignificant, then it must be concluded that this relationship is invariant across language groups after controlling for cognitive covariates.

Research Question 2

The second research question is whether reading attitudes predicts Latino ninth graders' vocabulary after controlling for language group, prior vocabulary achievement, and word reading ability and, if so, whether this relationship depends on language group. This research question is premised on the theory that reading attitudes catalyzes cognitive processes that are conducive to implicit vocabulary development. In the present study, vocabulary has been measured at two time points. While it is highly preferable to model change using data from at least three time points, two-wave growth measures are commonly (although not optimally) employed in the behavioral sciences (Willett, 1989b).

There are three general approaches for testing two-wave data, including analysis of covariance (ANCOVA), simple difference scores, and residual change scores. The ANCOVA method provides greater statistical power when, as in the present case, the reliability of measures is less than perfect, there is an increase from pretest to posttest, and the groups are imbalanced at pretest (Kisbu-Sakarya, MacKinnon, & Aiken, 2013). Cohen and Cohen (1983, p. 423) refer to the ANCOVA approach as a *regressed change* model, wherein the postscore is the dependent variable and the prescore serves as a covariate associated with change. In the present case, prior vocabulary achievement will be controlled, and the remaining significant covariates (e.g., reading attitudes) may be theoretically conceptualized (with the greatest caution) as predictors of growth.

It is important to note at this point several potential threats to internal validity. First, other variables not included in the model may influence vocabulary development, and these variables may even be associated with reading attitudes, thus creating a spurious

relationship between reading attitudes and vocabulary growth. Second, differences in students' vocabulary scores at Time 1 and Time 2 may not actually reflect growth. Other confounding influences, such as hypothetical differences in the testing environment or practice effects, could produce the illusion of change. Furthermore, the use of raw scores to measure change is controversial and potentially problematic. While some prominent researchers argue that the raw score is the most appropriate measure of vocabulary (Willett, 1989a, p. 378), others argue that raw score change is difficult to interpret with meaning and accuracy because position on the measurement construct is confounded with a nonuniform metric (Bezruczko, 2004). That is, if Student 1 improves his score from 10 to 14, this may not be the same thing as Student 2 improving her score from 20 to 24. Therefore, in the present study, it would be safer to interpret any significant findings in this analysis as being consistent with a theory of change, but not necessarily as convincing support for that theory.

That being said, this research question will also be addressed using an HRA with five distinct steps. The first will model language group differences, the second will control for prior vocabulary achievement, the third will control for cognitive covariates, the fourth will investigate reading attitudes, and the fifth will explore the theorized interaction between language group and reading attitudes. Each step of the analysis will provide the increase in *Y* variance accounted for by the new variable above and beyond that which has already been accounted for by the prior IVs.

Step 1. As with the first research question, a structural set of dummy variables will be included at Step 1 in order to control for between-group differences in both

vocabulary and vocabulary development. The corresponding variable coding system is provided in Table 3.2 (above). All three language group dummy variables will be entered into the model at the same time, producing the following equation:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + e,$$

where b_1–b_3 provide the significance tests for each of the three between-group contrasts. The coefficient for D_1 tests the hypothesis that I-FEP students possess vocabulary knowledge equal to that of English only students at Time 2. D_2 represents the corresponding contrast between true ELs and English only children, and D_3 compares the vocabulary knowledge of R-FEP students with that of English only students. If the school personnel have been effective in their classification of these children, $b1$ and b_3 should be nonsignificant, while $b2$ should be significant and negative.

The estimates and interpretations of these coefficients are expected to change as additional covariates are added to the model. For example, once prior vocabulary achievement has been controlled, each coefficient will represent its respective group's average propensity for vocabulary development relative to English only students. It is expected that I-FEP and R-FEP students will develop at the same pace as English only students since it has been determined that they are capable of succeeding in the regular instructional program. Similarly, instructional resources have been specially designed to meet the needs of true ELs, suggesting that these students' should also develop on parity with native speakers. The direction and significance levels of b_1–b_3 provide a statistical test of these assumptions.

Step 2. In the second step, vocabulary at Time 1 is added as a covariate in order to control for prior achievement. This provides a strong statistical control because a large portion of the variance in vocabulary at Time 2 will be explained in this step of the regression equation, thus increasing statistical power. This procedure has been used extensively in the reading comprehension literature as a strategy for modeling growth (Allen et al., 1992; Onatsu-Arvilommi & Nurmi, 2000; Taboada et al., 2009). As discussed above, it assumes that when a measure of achievement at an earlier date (Time 1) acts as a control for a later measure of achievement (Time 2), a third variable that is associated with the latter measure can be conceptualized as a predictor of growth (Cohen & Cohen, 1983, p. 417). While limitations related to use of raw scores make it difficult to conclude that growth is occurring in the present case, significant coefficients among subsequent predictors would at least be consistent with a theory of growth. Thus, prior achievement will be entered at Step 2 to form the equation:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + b_4X_1 + e,$$

where b_4 is the coefficient estimate for the effect of vocabulary at Time 1 on vocabulary at Time 2, controlling for language group. The change in R^2 (or ΔR^2) at Step 2 will represent the incremental variance in vocabulary at Time 2 accounted for by prior achievement over and above that explained by language group. This covariate is expected to explain the largest portion of the variation in the dependent variable.

Step 3. Word reading ability is understood to play a key role in the vocabulary development of older children (Verhoeven et al., 2011), and several authors have advanced the theory that reading fluency exposes the reader to an expanded vocabulary

(e.g., Stanovich & Cunningham, 1992; Verhoeven et al., 2011; Yovanoff et al., 2005), thus facilitating implicit vocabulary development. Thus, the word reading ability measures of word recognition skills and reading fluency will be added to the model as cognitive controls. While these measures are significantly correlated with one another, as well as with vocabulary, collinearity is not a problem because these are intended only as control variables and preliminary analyses revealed only weak correlations between reading attitudes and word reading ability measures. This finding is relatively consistent with prior literature which found that reading attitudes was positively related to reading comprehension but not to word reading ability (Askov & Fischbach, 1973).

Since word reading ability is conceptualized as influencing vocabulary development between Times 1 and 2, it is preferable to include a measure that best represents students' word reading ability as it existed during that span of time. To this ends, students' scores from Time 1 and Time 2 will be averaged together to create a single variable. In Step 3, students' average word recognition skills and average reading fluency will be added to the model:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + b_4X_1 + b_5X_2 + b_6X_3 + e,$$

where b_5 is the coefficient estimate for the unique effect of average word recognition skills on vocabulary at Time 2, and b_6 is the coefficient estimate for the unique effect of average reading fluency. The ΔR^2 at Step 3 will represent the incremental variance in vocabulary at Time 2 accounted for by average word reading ability over and above that explained by language group and prior achievement.

Step 4. Reading attitudes is the independent variable of primary interest. Entering this variable into the model after a number of strong statistical controls provides a very conservative test of the relationship between reading attitudes and vocabulary development. Since reading attitudes is theorized to influence the children's vocabulary during the period between Time 1 and Time 2, the reading attitudes scores for both time points will be averaged together to create one reading attitudes variable. In Step 4, average reading attitudes will be added to the model:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + b_4X_1 + b_5X_2 + b_6X_3 + b_7X_4 + e,$$

where b_7 is the coefficient estimate for the unique effect of average reading attitudes on vocabulary at Time 2 over and above that explained by language group and reading fluency. It is important to note that, not only must reading attitudes produce a statistically significant effect on vocabulary, but it must also represent a substantively significant portion of the variation in vocabulary. Therefore, the ΔR^2 at Step 4 will be important for determining whether reading attitudes is a sensible target for intervention, at least among the students of whom this sample is representative. As discussed above, this analysis should provide enough statistical power to detect an effect size of .07.

Step 5. The second half of the second research question seeks to determine whether the relationship between reading attitudes and vocabulary varies by language group. In order to formally address this question, three interaction terms will be formed by multiplying each language group dummy variable by the average reading attitudes measure, creating the equation:

$$\hat{Y} = a + b_1D_1 + b_2D_2 + b_3D_3 + b_4X_1 + b_5X_2 + b_6X_3 + b_7X_4 + b_8(D_1 \times X_4) +$$
$$b_9(D_2 \times X_4) + b_{10}(D_3 \times X_4) + e,$$

where b_8 represents the difference in the regression of vocabulary on average reading attitudes between English only students and I-FEP students, b_9 is the difference in regression lines of English only students and "true" EL students, and b_{10} is the difference in the regression lines of English only students and R-FEP students. If one of these coefficients is significant, it indicates that the effect of reading attitudes on vocabulary development differs between English only children and the respective second language learner group. Nonsignificant coefficients, on the other hand, would indicate that this relationship is invariant across language groups.

CHAPTER 4

Results

This chapter provides the results of the analyses detailed in Chapter 3. First, descriptive statistics are presented for data at both time points with findings disaggregated by language group. Next, results are presented for Research Question 1, beginning with tests of the assumptions of HRA. Finally, the assumptions of HRA are tested for Research Question 2, followed by a summary of the results.

Descriptive Statistics

Weighted means, standard deviations, minimum values, and maximum values are provided for measures at Time 1 (see Table 4.1) and Time 2 (see Table 4.2) for the entire sample, as well as each language group. For simplicity, only statistics from Time 2 will be summarized in this section. However, statistics from Time 1 are provided in the tables because Research Question 2 draws on data from both time points. All weighted variables were approximately normally distributed.

One-way analyses of variance (ANOVAs) were conducted to inspect for between-group differences for each variable. Language groups differed on each of the five cognitive measures, but there were no between-group differences on either of the two reading attitudes scales. It is known that non-independent significance tests result in an inflated type-I error rate; however, even after applying Bonferroni correction, the results remained the same. Post-hoc analyses were also conducted using Bonferroni correction in order to determine where between-group differences might exist.

"True" ELs demonstrated poorer reading comprehension abilities than the I-FEP and R-FEP groups, and they scored below all the other three groups on the vocabulary test. "True" ELs also had lower word identification scores than all the other three groups. English only children demonstrated better word decoding skills than the three second language learner groups, while "true" ELs had the lowest word decoding scores. English only students and I-FEP students were faster readers than the "true" ELs and the R-FEP students. There were no between-group differences in either reading attitudes measure.

Correlation tables are also provided for measures at Time 1 (Table 4.3) and Time 2 (Table 4.4). Given the large size of the tables, 1's have been added along the diagonals in order to help orient the reader. Among "true" ELs, there was a significant inter-subscale correlation between academic reading attitudes and recreational reading attitudes. However, cognitive measures were not significantly correlated with one another. This may have been caused by restriction of range as well as the decreased effective sample size of the "true" EL group as a result of weighting the sample. Most notably, among "true" ELs, reading comprehension and vocabulary were uncorrelated. However, when an unweighted correlation analysis was conducted along with the removal of two bivariate outliers, reading comprehension and vocabulary were highly correlated, $r(22) = .60$, $p < .01$.

Among remaining groups, reading comprehension and vocabulary were highly related. Both reading comprehension and vocabulary were moderately correlated with all three word reading ability measures. Recreational reading attitude was positively related

Table 4.1
Weighted Descriptive Statistics by Language Group for Measures at Time 1.

Measure		*N* (Unweighted)	Mean (*SD*)	Min	Max
Reading comprehension*	Total	123	21.90 (10.58)	5	43
	EO	39 (31)	20.19 (10.49)	8	37
	I-FEP	29 (30)	23.85 (10.56)	9	40
	EL	14 (27)	14.56 (3.11)	7	22
	R-FEP	41 (35)	24.70 (11.11)	5	43
Vocabulary*	Total	123	22.91 (8.09)	5	38
	EO	39 (31)	25.55 (8.62)	6	38
	I-FEP	29 (30)	22.96 (8.41)	6	32
	EL	14 (27)	13.15 (5.14)	5	20
	R-FEP	41 (35)	23.71 (5.46)	10	30
Word recognition skills*	Total	123	23.79 (3.66)	11	30
	EO	39 (31)	24.70 (3.48)	12	30
	I-FEP	29 (30)	24.74 (3.10)	17	29
	EL	14 (27)	19.77 (3.51)	11	25
	R-FEP	41 (35)	23.62 (3.37)	16	29
Word decoding skills*	Total	123	20.41 (5.14)	8	28
	EO	39 (31)	23.40 (4.03)	10	28
	I-FEP	29 (30)	20.46 (3.10)	12	27
	EL	14 (27)	14.47 (4.90)	8	25
	R-FEP	41 (35)	19.56 (5.30)	9	27
Reading fluency (WC/M)*	Total	123	135.02 (26.85)	53	117
	EO	39 (31)	146.44 (25.93)	76	177
	I-FEP	29 (30)	142.42 (27.67)	73	170
	EL	14 (27)	109.33 (20.03)	53	137
	R-FEP	41 (35)	127.71 (20.98)	89	171

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.
*Means varied significantly between groups ($p < .05$).

Table 4.1 (continued)
Weighted Descriptive Statistics by Language Group for Measures at Time 1.

Measure		*N* (Unweighted)	Mean (*SD*)	Min	Max
ERAS-Academic (Time 1)	Total	123	13.46 (3.07)	6	20
	EO	39 (31)	13.03 (3.26)	6	18
	I-FEP	29 (30)	13.63 (3.96)	8	19
	EL	14 (27)	13.25 (2.80)	6	20
	R-FEP	41 (35)	13.81 (2.20)	9	17
ERAS-Recreational (Time 1)	Total	123	12.62 (3.96)	5	20
	EO	39 (31)	13.13 (3.62)	5	20
	I-FEP	29 (30)	12.27 (4.98)	5	20
	EL	14 (27)	12.86 (3.10)	7	20
	R-FEP	41 (35)	12.29 (3.82)	5	19

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.
*Means varied significantly between groups ($p < .05$).

Table 4.2
Weighted Descriptive Statistics by Language Group for Measures at Time 2.

Measure		*N* (Unweighted)	Mean (*SD*)	Min	Max
Reading comprehension*	Total	120[a]	25.45 (11.81)	1	45
	EO	38 (29)	24.08 (13.05)	8	44
	I-FEP	28 (29)	29.43 (11.04)	9	45
	EL	14 (26)	13.11 (5.70)	1	32
	R-FEP	41 (36)	28.14 (9.73)	6	43
Vocabulary*	Total	120	24.68 (9.31)	3	42
	EO	38 (29)	25.12 (9.83)	7	42
	I-FEP	28 (29)	26.96 (9.53)	3	39
	EL	14 (26)	14.26 (4.62)	3	21
	R-FEP	41 (36)	26.20 (7.52)	7	36

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.
*Means varied significantly between groups ($p < .05$).
[a]Weighted group sizes do not sum to *N* due to rounding error.

Table 4.2 (continued)
Weighted Descriptive Statistics by Language Group for Measures at Time 2.

Measure		*N* (Unweighted)	Mean (*SD*)	Min	Max
Word recognition skills*	Total	120	24.54 (3.52)	6	29
	EO	38 (29)	25.67 (3.71)	6	29
	I-FEP	28 (29)	24.78 (2.55)	19	28
	EL	14 (26)	19.89 (2.66)	13	27
	R-FEP	41 (36)	24.88 (3.00)	18	29
Word decoding skills*	Total	120	21.49 (4.37)	6	29
	EO	38 (29)	24.04 (4.22)	6	29
	I-FEP	28 (29)	21.81 (3.59)	13	27
	EL	14 (26)	17.00 (4.34)	7	26
	R-FEP	41 (36)	20.42 (3.40)	11	29
Reading fluency (WC/M)*	Total	120	143.07 (29.48)	34	185
	EO	38 (29)	153.14 (26.95)	34	184
	I-FEP	28 (29)	153.89 (31.18)	72	183
	EL	14 (26)	114.53 (19.92)	83	150
	R-FEP	41 (36)	135.86 (25.19)	96	185
ERAS-Academic (Time 2)	Total	120	12.73 (2.92)	5	20
	EO	38 (29)	13.14 (2.96)	8	19
	I-FEP	28 (29)	11.94 (3.52)	5	19
	EL	14 (26)	11.95 (3.02)	9	20
	R-FEP	41 (36)	13.15 (2.27)	7	17
ERAS-Recreational (Time 2)	Total	120	11.98 (3.79)	5	19
	EO	38 (29)	13.14 (3.46)	5	18
	I-FEP	28 (29)	10.23 (3.32)	5	19
	EL	14 (26)	12.06 (3.23)	5	16
	R-FEP	41 (36)	12.08 (4.21)	5	19

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.
*Means varied significantly between groups ($p < .05$).

Table 4.3
Weighted Correlations Between Measures by Language Group at Time 1.

1	2	3	4	5	6	7
1 Reading comprehension						
Total					1.00	
EO					1.00	
I-FEP					1.00	
EL					1.00	
R-FEP					1.00	
2 Vocabulary						
Total					**.65**	1.00
EO					**.63**	1.00
I-FEP					**.78**	1.00
EL					.29	1.00
R-FEP					**.70**	1.00
3 Word recognition skills						
Total					**.40**	**.61** 1.00
EO					.20	**.72** 1.00
I-FEP					**.41**	**.44** 1.00
EL					-.02	.34 1.00
R-FEP					**.57**	**.46** 1.00
4 Word decoding skills						
Total					**.23**	**.40** **.69** 1.00
EO					-.05	**.47** **.72** 1.00
I-FEP					**.46**	.31 **.67** 1.00
EL					-.18	-.44 .45 1.00
R-FEP					**.38**	.19 **.64** 1.00

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.
Bold printed correlations are significant: $p < .05$ (two-tailed).

Table 4.3 (continued)
Weighted Correlations Between Measures by Language Group at Time 1.

1	2	3	4	5	6	7					
5 Reading fluency (WC/M)											
	Total				**.21**	**.61**	**.67**	**.51**	1.00		
	EO				.08	**.64**	**.68**	**.71**	1.00		
	I-FEP				.35	**.60**	**.65**	.21	1.00		
	EL				.11	.48	**.56**	-.07	1.00		
	R-FEP				.24	**.39**	**.52**	**.35**	1.00		
6 ERAS-Academic											
	Total				.17	**.31**	.16	.05	**.22**	1.00	
	EO				-.05	.12	.14	.18	**.33**	1.00	
	I-FEP				.23	**.66**	.20	.03	**.41**	1.00	
	EL				.33	-.12	-.11	-.16	-.04	1.00	
	R-FEP				**.32**	**.47**	**.32**	.17	.06	1.00	
7 ERAS-Recreational											
	Total				**.48**	**.47**	**.24**	**.19**	**.24**	**.60**	1.00
	EO				**.64**	**.61**	**.44**	**.39**	**.42**	**.37**	1.00
	I-FEP				.35	**.59**	.06	-.03	.25	**.81**	1.00
	EL				.37	.06	-.28	-.37	-.10	**.79**	1.00
	R-FEP				**.65**	**.46**	**.46**	**.34**	.19	**.61**	1.00

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.
Bold printed correlations are significant: $p < .05$ (two-tailed).

Table 4.4
Weighted Correlations Between Measures by Language Group at Time 2.

1	2	3	4	5	6	7
1 Reading comprehension						
Total					1.00	
EO					1.00	
I-FEP					1.00	
EL					1.00	
R-FEP					1.00	
2 Vocabulary						
Total					**.78**	1.00
EO					**.71**	1.00
I-FEP					**.89**	1.00
EL					.05	1.00
R-FEP					**.72**	1.00
3 Word recognition skills						
Total					**.40**	**.58** 1.00
EO					.17	**.49** 1.00
I-FEP					**.40**	.35 1.00
EL					.06	**.46** 1.00
R-FEP					**.51**	**.66** 1.00
4 Word decoding skills						
Total					**.29**	**.40** **.73** 1.00
EO					.20	**.45** **.74** 1.00
I-FEP					**.41**	.28 **.66** 1.00
EL					.13	.17 **.65** 1.00
R-FEP					.25	**.32** **.66** 1.00

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.
Bold printed correlations are significant: $p < .05$ (two-tailed).

Table 4.4 (continued)
Weighted Correlations Between Measures by Language Group at Time 2.

1	2	3	4	5	6	7					
5 Reading fluency (WC/M)											
	Total				**.50**	**.54**	**.61**	**.56**	1.00		
	EO				**.42**	**.60**	**.66**	**.70**	1.00		
	I-FEP				**.62**	**.60**	**.66**	.37	1.00		
	EL				-.15	.41	.42	.25	1.00		
	R-FEP				**.49**	.26	**.41**	**.36**	1.00		
6 ERAS-Academic											
	Total				.04	.11	**.22**	**.22**	.11	1.00	
	EO				-.26	-.05	.09	.27	.22	1.00	
	I-FEP				.14	.14	.17	.14	.05	1.00	
	EL				.23	-.33	-.33	-.13	**-.57**	1.00	
	R-FEP				.30	**.35**	**.59**	**.39**	.29	1.00	
7 ERAS-Recreational											
	Total				**.29**	**.31**	**.21**	**.21**	.10	**.51**	1.00
	EO				**.65**	**.67**	.24	.29	**.44**	.26	1.00
	I-FEP				.10	.15	.08	-.09	.10	**.77**	1.00
	EL				.31	.02	-.38	-.42	-.29	**.62**	1.00
	R-FEP				**.34**	**.32**	**.43**	**.48**	-.03	**.53**	1.00

Note: EO = English only, I-FEP = initial fluent-English-proficient, EL = "true" English learner, R-FEP = redesignated fluent-English-proficient.
Bold printed correlations are significant: $p < .05$ (two-tailed).

to a number of reading outcomes for multiple language groups. However, academic reading attitude was generally uncorrelated with reading measures.

Research Question 1

The first research question was whether reading attitudes predicts Latino ninth graders' reading comprehension after controlling for language group, vocabulary, and word reading ability and, if so, whether this relationship depends on language group. In order to answer this question, an HRA was used with control variables entered in early steps of the analysis followed by reading attitudes and subsequent interaction terms. The assumptions of HRA were first tested in order to assure the validity of the results.

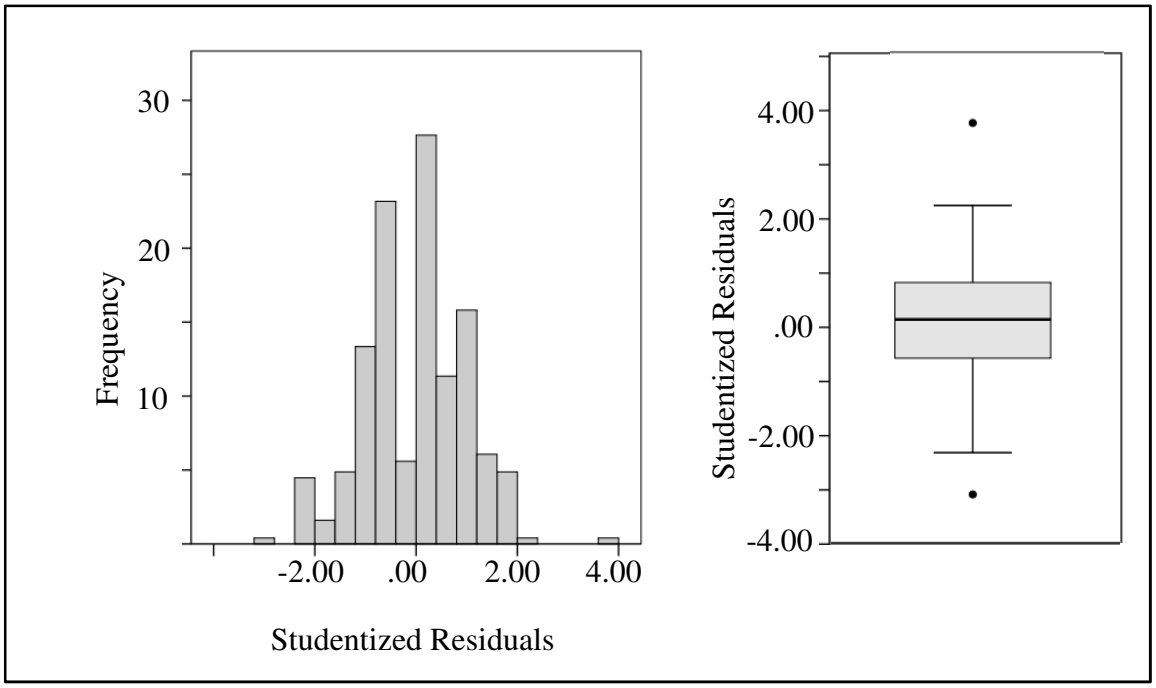
Testing assumptions. The inferential use of OLS regression relies on certain theoretical and statistical assumptions. The key theoretical assumption is that the error terms are not correlated in that the observations are independent of one another. In respect to statistical assumptions, the analysis of the residuals provides the basis for assessing the adequacy of a regression model (Cohen & Cohen, 1983, p. 126). Our confidence in the results produced by the model rests partly on a set of assumptions pertaining to these residuals, including normality, homoscedasticity, and linearity. The tenability of these assumptions was examined using the standard methods which include both statistical tests and graphical methods.

Independence of observations. Independence means that the observations are not influenced by an outside factor common to several of the observations. In education research, a common example of non-independence is when students are nested within classrooms or schools. In such cases, multilevel modeling techniques may be necessary

in order to control for between-group effects. In the current study, students have been randomly sampled from the ninth grade population of a single high school. However, these students came primarily from three different middle schools, and some of them shared the same teachers at the time of the study. While these are technically violations of the assumption of independence, these relationships are too complex to practically model, and they are unlikely to having substantial bearing on the coefficients of interest.

Normally distributed residuals. In order to test the assumption of normally distributed residuals, HRAs were run separately for data at each time point, and studentized residuals were saved as a new variable in the data set. Histograms and

Figure 4.1. Histograms and Boxplots of Studentized Residuals for Research Question 1.

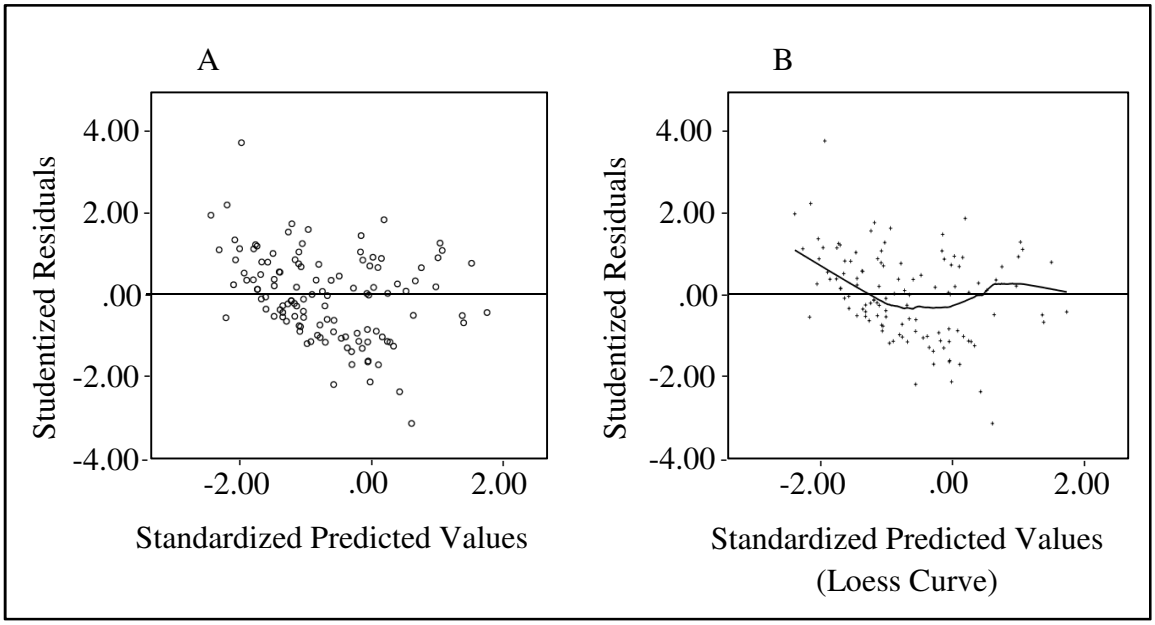


boxplots were also generated in order to provide a visual representation of the distribution of residuals as well as to detect potential outliers (see Figure 4.1). Studentized residual values ranged from -3.16 to 3.74. Two potential outliers were identified in the boxplot, both of which fell outside of the +/- 3 conventional range of acceptable values (Cohen & Cohen, 1983, p. 128). However, since the outliers were few in number and appeared at both the low and high ends of the distribution, they were retained in the dataset, as suggested by Cohen & Cohen (p. 128). A later analysis confirmed that the exclusion of these two observations resulted in no significant or substantive changes to the results.

Descriptive statistics confirmed that residuals were normally distributed with skewness of -.17 (SE = .22) and kurtosis of .46 (SE = .44). This conclusion was consistent with Kolmogorov-Smirnov and Shapiro-Wilk tests of normality, both of which yielded non-significant results. Thus, the assumption of normally distributed residuals was supported.

Homoscedasticity. Heteroscedasticity occurs when the scatter of residuals is not consistent over the possible range of predicted values of $\hat{Y}$ and can be identified by its characteristic fan shape, with small residuals clustered at the low end and large residuals spread out at the high end (or vice versa). Heteroscedasticity is of particular concern in the case of weighted OLS regression because, if the errors in the unweighted sample are homoscedastic, the use of sampling weights is known to induce heteroscedasticity, thus requiring the use of more robust standard error estimates (Winship & Radbill, 1994).

Figure 4.2. Weighted Studentized Residuals Plotted Against Predicted Values of $\hat{Y}$ for Research Question 1.



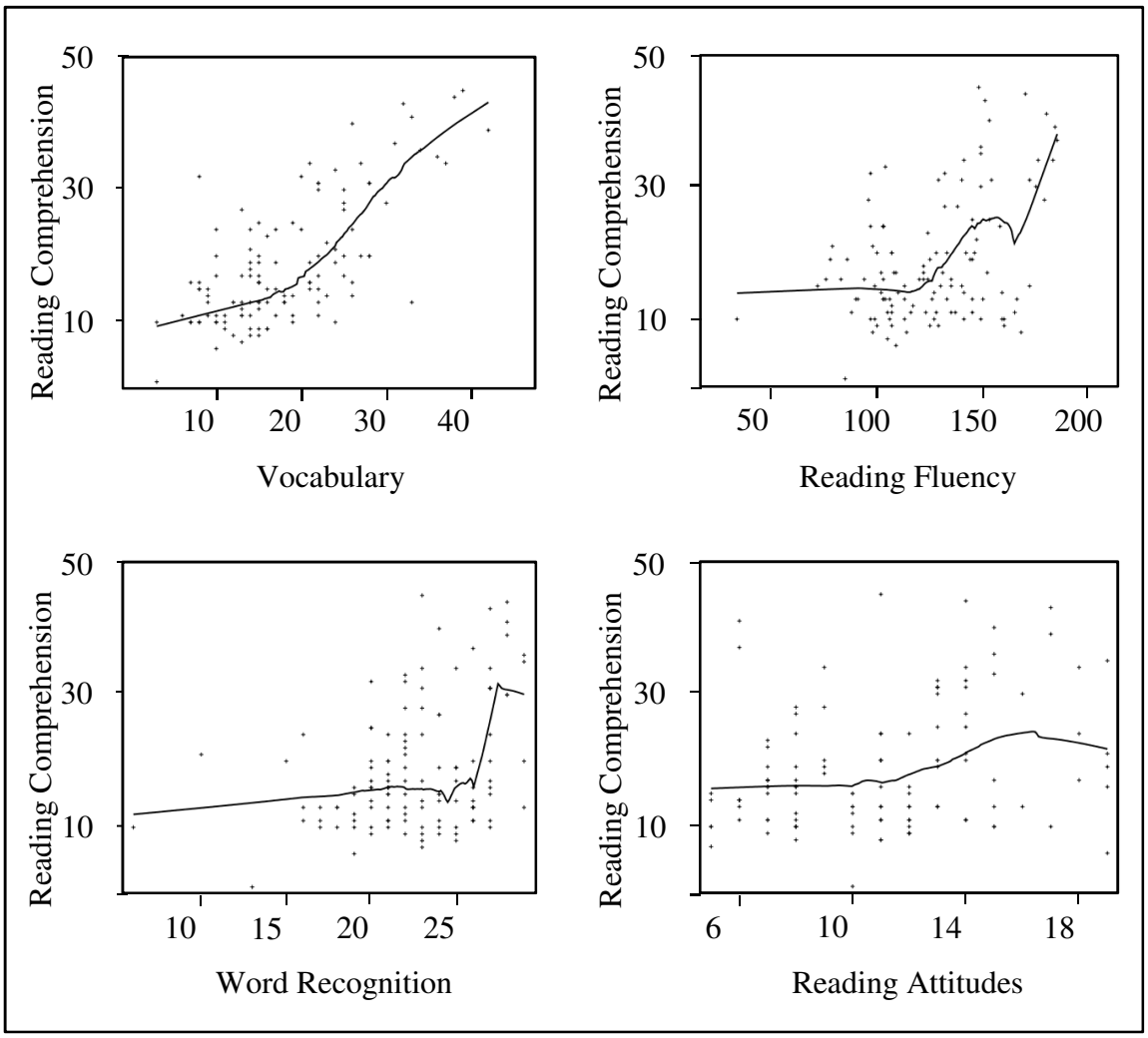
To informally test the assumption of homoscedasticity, residual values were plotted against predicted values of $\hat{Y}$ on a scatterplot (see Figure 4.2A). A visual inspection confirmed that the residuals were approximately evenly distributed with no extreme fanning at either end of the distribution.

Next, White's (1980) direct test for heteroscedasticity was employed in order to corroborate the traditional but subjective visual inspection. This test is conducted by regressing the square of the unstandardized residuals on (a) all original (significant) independent variables, (b) the square of each independent variable (excluding dummy variables), and (c) all two-way interactions between independent variables (Pryce, 2011). This produces a χ^2 test statistic calculated as the product of the sample size and the

unadjusted coefficient of determination with degrees of freedom equal to the total number of regressors. In the present case, an n of 120 and R^2 of .10 produced a χ^2 value of 12.00 with 21 degrees of freedom. This was well below the critical χ^2 value of 32.67, thus supporting the assumption of homogeneity of variance.

Linearity. Curvilinearity occurs when a nonlinear relationship exists between one or more of the IVs and the DV and can be recognized when negative residuals appear mainly at the low and high predicted values of $\hat{Y}$ and the positive residuals occur mostly at middle values (or vice versa). In order to aid visual interpretation, a loess curve was superimposed over the residuals along with a horizontal line along the mean of the studentized residuals (see Figure 4.2B). A visual inspection revealed that more positive residuals appeared to occur at the low end of predicted values of $\hat{Y}$, and more negative residuals seemed to occur at the middle values. At the high predicted values of $\hat{Y}$, residuals varied around the mean. In order to further explore this relationship, each continuous independent variable was plotted against the dependent reading comprehension variable with loess curves superimposed on top (see Figure 4.3). In each instance, there appeared to be a small cluster of negative residuals near the middle of the distribution of the independent variable. In order to test for the presence of curvilinearity, individual regression analyses were run for each independent variable with a quadratic terms for the independent variable included in the regression. The quadratic term was non-significant for vocabulary, word identification, and reading fluency. The quadratic term for reading attitudes was significant; however, this appeared to be the result of two influential cases (students with extremely low reading attitudes scores but extremely high

Figure 4.3. Scatterplots for Each Independent Variable in Research Question 1.



reading comprehension scores). When these two unusual cases were excluded from the analysis, the quadratic term became nonsignificant. Consequently, it was concluded that all of the relationships in the model were in fact linear, but that an unmeasured variable was depressing the reading comprehension scores for some students.

Differences among language groups. An output summary for Research Question 1 is provided in Table 4.5. In Step 1 of the HRA, language group dummy variables were used to control for between-group differences in average reading

Table 4.5
Weighted OLS Hierarchical Regression Analysis Predicting Reading Comprehension. (n = 120)

	Step 1	Step 2	Step 3	Step 4
Predictor	β	β	β	β
Intercept (Unstandardized)	24.08	3.26	-.55	-3.60
Language Group				
IFEP	.19†	.11†	.16*	.48*
EL	–.30**	–.03	–.04	.03
RFEP	.16	.16*	.19**	.30
Cognitive Covariates				
Vocabulary		.72**	.66**	.64**
Word Recognition		–.17*	–.19*	–.19*
Reading Fluency		.21**	.23**	.23**
Reading Attitudes				
ERAS-R			.15*	.23†
Language Group Interactions				
ERAS-R × IFEP				–.31
ERAS-R × EL				–.08
ERAS-R × RFEP				–.10
Step f^2	.20	1.36	.05	.02
Step ΔR^2	.17**	.48**	.02*	.01
Total R^2	.17**	.65**	.67**	.67**

†$p < .10$, *$p < .05$, **$p < .01$.

comprehension scores. These together explained 17% of the variance in reading comprehension. On average, "true" ELs scored significantly below English only children ($\beta = -.30$, $p < .01$), while there was no significant difference between R-FEP students and English only students ($\beta = .16$, $p = .10$). I-FEP students tended to score higher than English only children, but the difference only approached significance ($\beta = .19$, $p = .05$).

After introducing cognitive covariates in Step 2, the difference in reading comprehension scores between English only children and "true" ELs became nonsignificant ($\beta = -.03$, $p = .64$), consistent with the conclusion that the originally observed difference in these children's reading comprehension skills could be attributed to disparities in vocabulary and word reading ability. After controlling for reading attitudes in Step 3, English only children scored significantly below both I-FEP students ($\beta = .16$, $p < .05$) and R-FEP students ($\beta = .19$, $p < .01$). There remained no significant difference between English only students and "true" ELs ($\beta = -.04$, $p = .54$).

Reading attitudes as a predictor of reading comprehension. Reading attitudes was added to the model at Step 3. After controlling for language group and cognitive covariates, reading attitudes independently explained a significant amount of additional variance in students' reading comprehension scores ($\beta = .15$, $p < .05$). It explained an additional 2% of the variance for a total R^2 of .67. This corresponded to a small effect size for reading attitudes ($f^2 = .05$) according to Cohen's criteria. As mentioned above, there were two students who had extremely low reading attitudes scores but extremely high reading comprehension scores. When these two influential cases were omitted from the analysis, the additional variance explained by reading attitudes doubled from $\Delta R^2 =$

.02 to $\Delta R^2 = .04$, the β coefficient increased from β = .15 ($p < .05$) to β = .24 ($p < .01$), and the effect size increased from small ($f^2 = .05$) to medium ($f^2 = .12$). While these two cases did not make a statistically significant difference in the results, their omission did improve the practical significance of the findings.

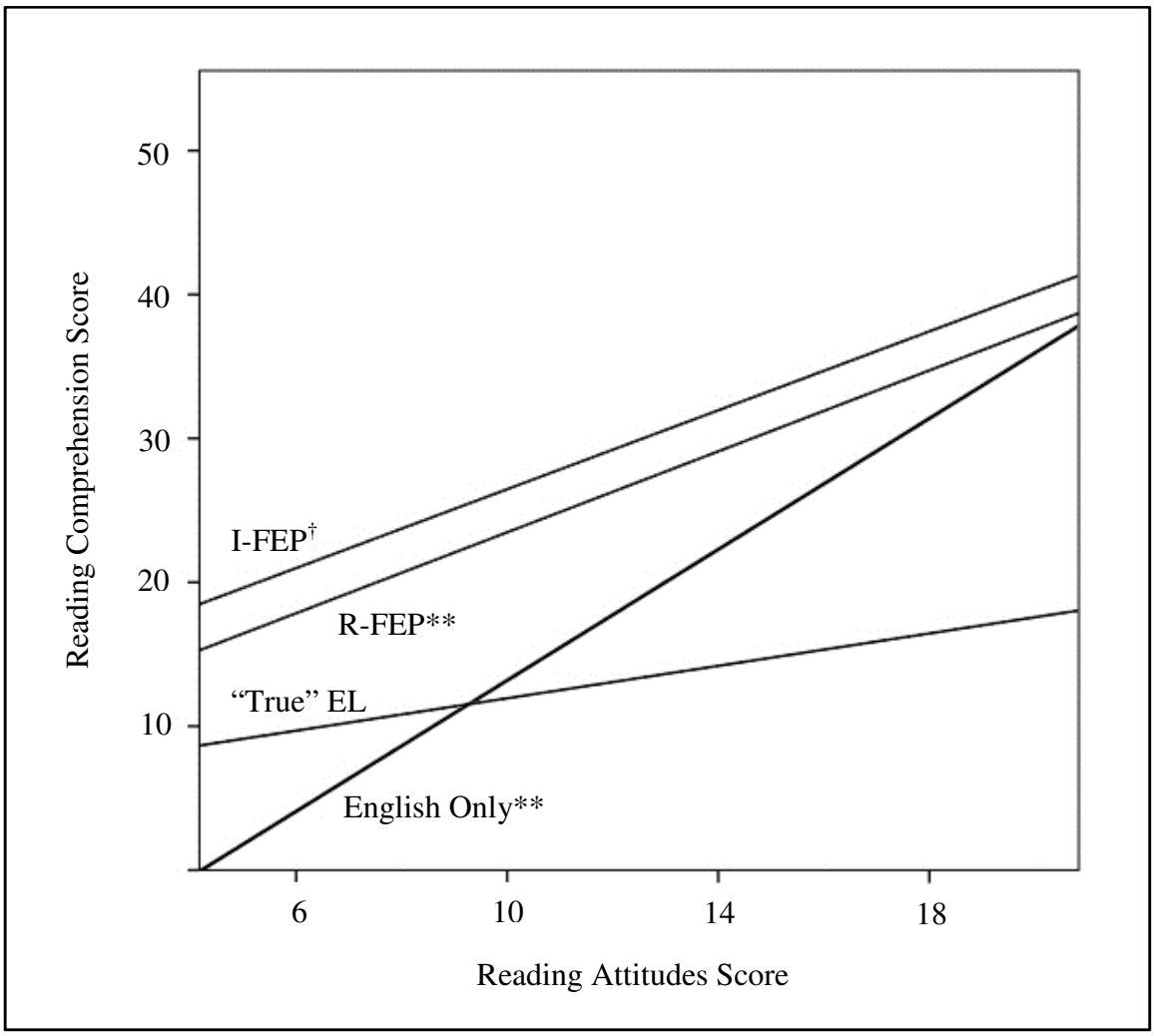
Investigating interaction effects. Reading attitudes-language group cross-product terms were added to the model at Step 4 in order to test for potential interaction effects. These terms together explained an additional 1% of the variation in students' reading comprehension scores, although this change was not statistically significant, $\Delta F(3, 108) = .75$, $p = .52$. After the inclusion of the cross-product terms, the reading attitudes coefficient only approached significance (β = .23, $p = .06$). While all of the cross-product terms were negative (suggesting that reading attitudes was less important for these language groups than for English only students), none of these coefficients approached statistical significance.[1]

When the two influential cases were omitted from the analysis, the reading attitudes coefficient regained significance (β = .28, $p < .05$), and the coefficients associated with all three interaction terms decreased in both size and significance.

---

[1] A post-hoc analysis was conducted in order to determine whether a reading attitudes-language group interaction would have existed had vocabulary and word reading ability not been controlled. After controlling for only language group, there was a significant main effect for reading attitudes, but all three interaction terms were significant. This means that reading attitudes predicted reading comprehension for native English speakers but not for any of the three English learner groups. However, when vocabulary and word reading ability were added to the model, the interaction effects disappeared. This suggests that the language and ethnic group interactions observed in prior studies could potentially be explained by group differences in foundational reading skills.

Figure 4.4. The regression of reading comprehension score on reading attitudes score by language group.



Note: Two influential cases have been omitted from the I-FEP and R-FEP groups (one from each group), strengthening the average relationship between reading attitudes and reading comprehension.

**Bivariate correlation is significant at $p < .01$.

†Bivariate correlation approaches significance at $p < .10$.

Furthermore, the ΔR^2 associated with the combined interaction terms decreased from $\Delta R^2 = .01$ to $\Delta R^2 = .00$. Therefore, it was concluded that reading attitudes predicted reading comprehension equally for all four language groups. Figure 4.4 provides the slope of the regression of reading comprehension on reading attitudes for each language group.

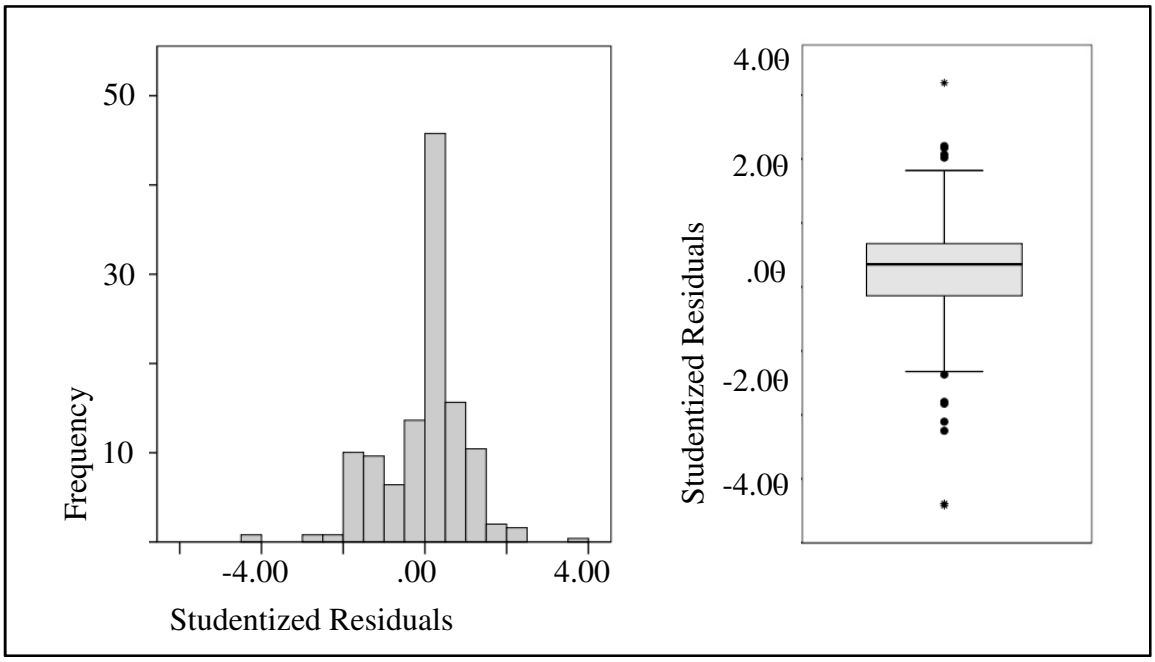
Research Question 2

The second research question was whether reading attitudes predicts Latino ninth graders' vocabulary after controlling for language group, prior achievement, and word reading ability and, if so, whether this relationship depends on language group. This research question was also addressed through the use of an HRA, beginning with tests of the assumptions of OLS regression.

Testing assumptions. Theoretical and statistical assumptions were considered to determine whether the analysis would produce valid results. As with Research Question 1, the assumption of independence of observations was technically violated because students were nested within classrooms and they came from different middle schools. However, these relationships were too complex to reliably model and were unlikely to impact the key coefficients of interest. Statistical assumptions again included normally distributed error terms, homoscedasticity, and linearity.

Normally distributed residuals. In order to test the assumption of normally distributed residuals, studentized residuals were saved as a new variable in the data set. Histograms and boxplots were generated in order to provide a visual representation of the distribution of residuals as well as to detect potential outliers (see Figure 4.5). A visual inspection of the histogram and boxplot suggested that the residuals were approximately

Figure 4.5. Histograms and Boxplots of Studentized Residuals for Research Question 2.

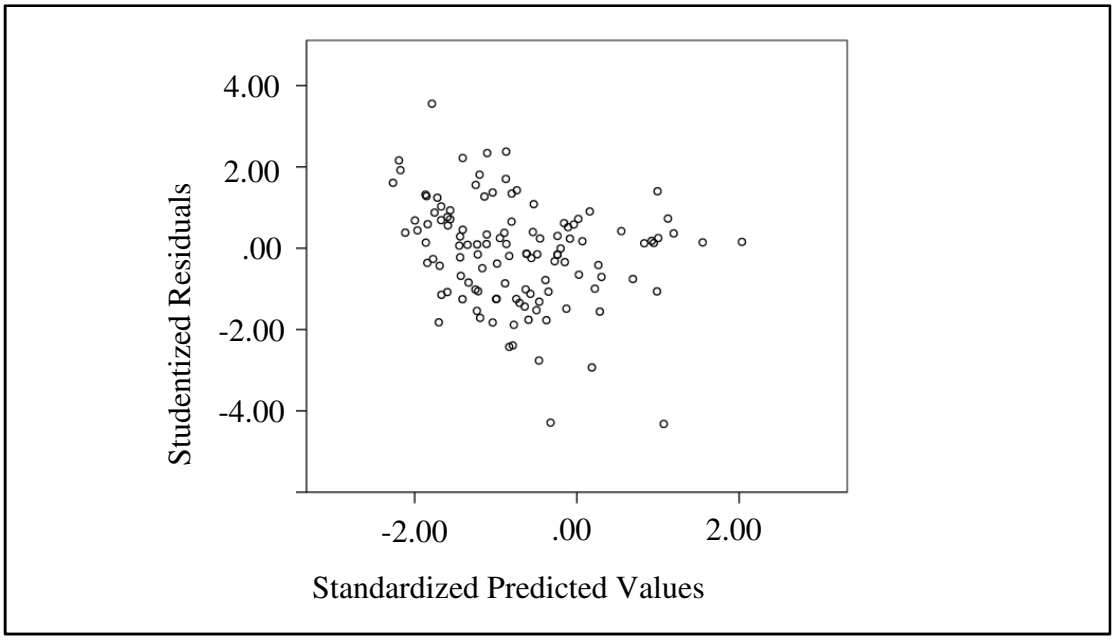


normally distributed with a leptokurtic kurtosis. Studentized values ranged from -4.32 to 3.55. Potential outliers were highlighted on the boxplot, three of which exceeded the conventional +/- 3 cutoff point (Cohen & Cohen, 1983, p. 128). In order to evaluate the influence of these extreme observations, the main analysis was conducted twice, bothwith and without the three outliers. This resulted in a minor change in the significance level of only one coefficient (noted below); therefore, all data were retained. Descriptive statistics of the studentized residuals indicated a slight, nonsignificant skewness of -.71 (*SE* = .22) with a significant leptokurtic kurtosis of 2.20 (*SE* = .44). A Kolmogorov-Smirnov test also produced significant results, suggesting that the distribution of residuals represented a departure from normality. However, since the distribution of residuals

contained no significant skew, and since the overall pattern of the distribution was approximately normal, the analysis proceeded.

Homoscedasticity. As before, residual values were plotted against predicted values of $\hat{Y}$ on a scatterplot (see Figure 4.6). A visual inspection revealed that the residuals were very evenly distributed across predicted values of $\hat{Y}$ with no apparent fanning at either end. Because of the particularly high risk for heteroscedasticity associated with weighted OLS regression, White's direct test for heteroscedasticity was conducted with all significant predictors in order to corroborate the visual inspection of the scatterplot. An R^2 of .12 and a sample size of 118 produced a χ^2 statistic of 14.04

Figure 4.6. Weighted Studentized Residuals Plotted Against Predicted Values of $\hat{Y}$ for Research Question 2.



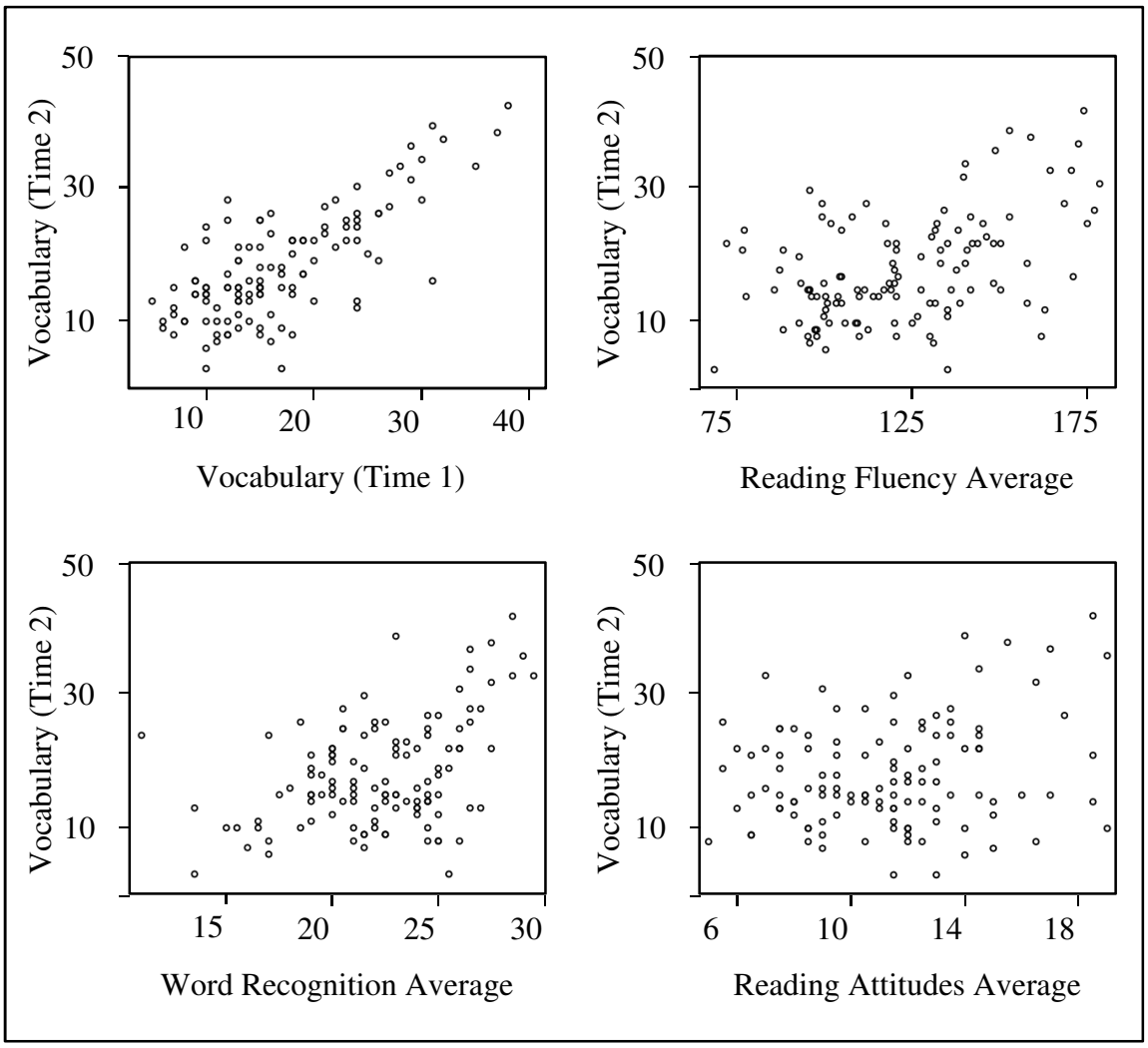
with 13 degrees of freedom, well below the critical value of 22.36. Thus, the assumption of homoscedasticity was supported, and the standard errors for all analyses were retained as originally calculated.

Linearity. The scatterplot was then examined for linearity. A more or less uniform band of positive and negative residuals were observed running from low to high values of $\hat{Y}$. This suggested that the IVs under consideration were linearly related to the DV. To further explore these relationships, individual scatterplots were created for each of the continuous independent variables in the model (see Figure 4.7). A visual inspection detected some slight clustering near the middle center of each graph; however, the overall patterns appeared to be linear in nature. In order to confirm this statistically, individual regression analyses were conducted for each independent variable with the inclusion of a quadratic term for that variable. All quadratic terms were nonsignificant, thus the assumption of linearity was supported.

Language group differences. Coefficients, effect sizes, and R^2 values at each step of the model are provided in Table 4.6. At Time 2, "true" ELs' vocabulary scores were significantly lower than those of the English only children. However, there was no significant difference between the average vocabulary scores of either fluent-English-proficient group and those of the English only students. Language group alone explained 17% of the variance in vocabulary scores, with a medium effect size of $f^2 = .20$.

Significant between-group differences emerged after controlling for prior achievement at Time 1. After controlling for prior achievement, English only students and "true" ELs performed equally well at Time 2. This suggests that the "true" EL

Figure 4.7. Scatterplots for Each Independent Variable in Research Question 2.



students developed at a similar pace as their English only counterparts, a seemingly positive finding. Unfortunately, the average growth for both of these groups was zero. Subsequent *t*-tests revealed no significant change in vocabulary from Time 1 to Time 2 for either English only children, $t(36) = -.63$, $p = .53$, $d = -.06$, or "true" ELs, $t(13) = .93$, $p = .37$, $d = .22$.

Table 4.6
Weighted OLS Hierarchical Regression Analysis Predicting Vocabulary Controlling for Prior Achievement. (n = 118)

	Step 1	Step 2	Step 3	Step 4	Step 5
Predictor	β	β	β	β	β
Intercept					
(Unstandardized)	25.27	.19	-4.59	-7.72	-13.70
Language Group					
IFEP	.07	.20**	.20**	.22**	.86**
EL	–.38**	.04	.07	.04	.50*
RFEP	.04	.15**	.16*	.17**	.53*
Prior Achievement					
Vocabulary (Time 1)		.84**	.80**	.72**	.72**
Word Reading Ability					
Word Recognition			.10	.10	.08
Reading Fluency			–.02	–.01	–.03
Reading Attitudes					
ERAS-R				.14*	.38**
Interaction Terms					
ERAS-R × IFEP					–.63**
ERAS-R × EL					–.48*
ERAS-R × RFEP					–.39†
Step f^2	.20	2.06	.02	.06	.12
Step ΔR^2	.17**	.56**	.01	.02*	.03**
Total R^2	.17**	.73**	.73**	.75**	.78**

†$p < .10$, *$p < .05$, **$p < .01$.

On the other hand, both fluent-English-proficient groups scored significantly higher than English only children at Time 2 after controlling for vocabulary at Time 1. This indicates that, on average, the I-FEP and R-FEP children's vocabularies increased

over the course of the ninth grade school year, while those of the English only and "true" EL students did not. Post-hoc *t*-tests revealed significant increases in average vocabulary scores for I-FEP children, $t(27) = 3.51$, $p < .01$, $d = .43$, as well as R-FEP children, $t(39) = 3.84$, $p < .001$, $d = .38$. Note that these results remain significant even after controlling for the inflated Type I error rate associated with the four post-hoc *t*-tests.

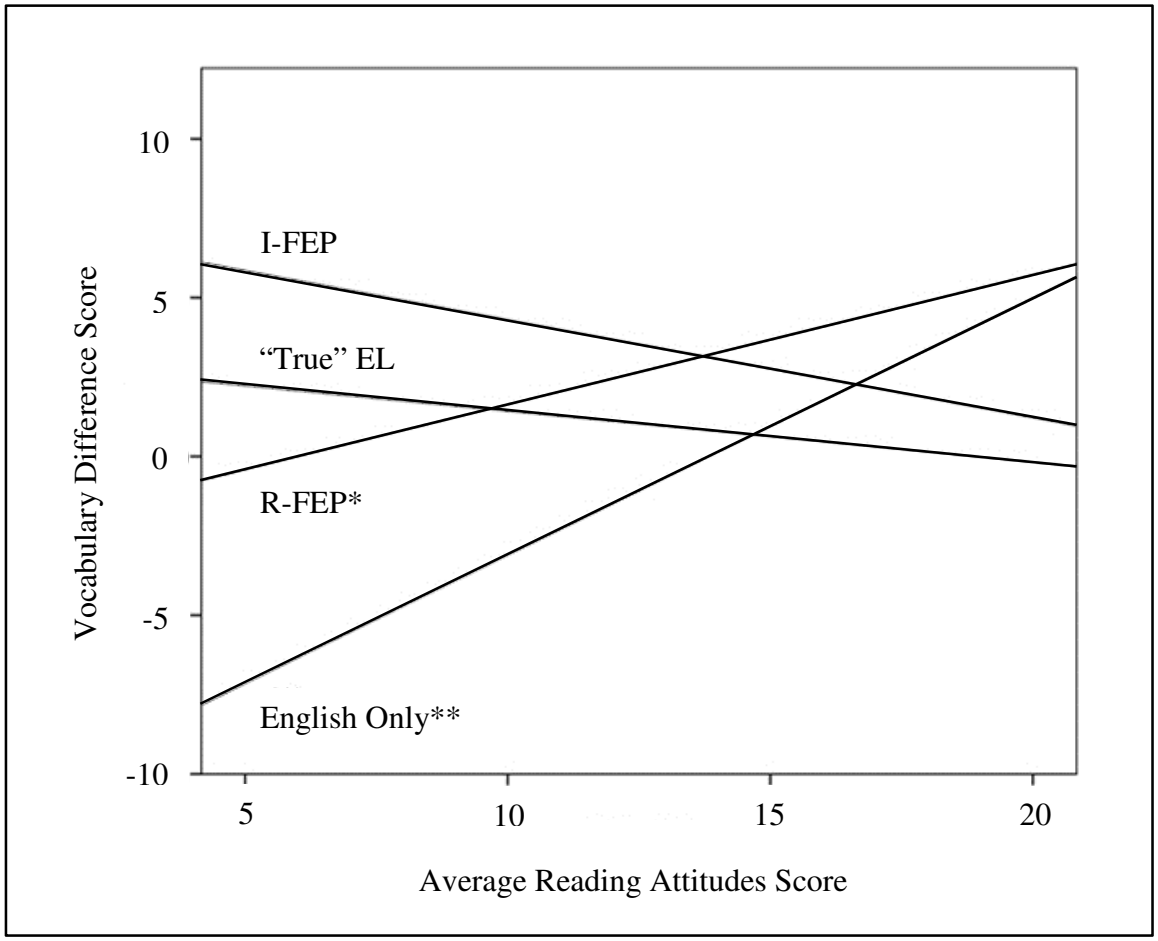
Word reading ability as a predictor of vocabulary growth. Neither word reading measure was significantly associated with vocabulary at Time 2 after controlling for prior achievement. The combination of both measures produced a very small effect ($f^2 = .02$) and made a non-significant contribution of only 1% to the total variance explained by the model. Thus, after controlling for language group and prior achievement, word reading ability was not a significant predictor of vocabulary growth for these ninth grade students.

Reading attitudes as a predictor of vocabulary growth. Reading attitudes was added to the model at Step 4. Reading attitudes produced a significant positive coefficient, evidencing a small to medium effect size ($f^2 = .06$) and adding a significant 2% to the total amount of variation explained by the model. This suggests that, after controlling for language group, prior achievement, and word reading ability, reading attitudes is a significant positive predictor of students' vocabulary development over the course of ninth grade.

Investigating interaction effects. Finally, reading attitudes-language group cross-product terms were added to the model in order to explore potential interaction effects. The addition of these terms produced a moderate effect ($f^2 = .12$) and explained

an additional 3% of the total variance in vocabulary at Time 2. Significant negative coefficients were associated with the interaction terms for the I-FEP group as well as the "true" EL group. However, the negative coefficient associated with the R-FEP group

Figure 4.8. The regression of vocabulary differences scores (Time 2 – Time 1) on reading attitudes by language group.



*Bivariate correlation is significant at $p < .05$.
**Bivariate correlation is significant at $p < .01$.

only approached significance (p = .08). This was the only coefficient that changed significance after the removal of extreme outliers, dropping just below .05 (p = .047). These findings suggest that reading attitudes is a significant predictor of vocabulary growth for English only children. However, reading attitudes does not predict vocabulary growth for "true" ELs and I-FEP students. The role of reading attitudes in the vocabulary development of R-FEP students is somewhat ambiguous, but a graphical representation of this interaction (see Figure 4.8) suggests that reading attitudes may function similarly for R-FEP students as it does for English only children.

CHAPTER 5

Discussion

This chapter first summarizes the key findings articulated in Chapter 4 and discusses them within the context of prior literature. Next, the theoretical and methodological explanations for the results are considered, especially those that were unexpected. Following that, implications of the findings are explored from the point of view of the practitioner. Finally, the limitations of the study are discussed along with suggested directions for future research.

Summary of Key Findings

Research Question 1. The first research question sought to determine whether reading attitudes predicts Latino ninth graders' reading comprehension after controlling for language group, vocabulary, and word reading ability and, if so, whether this relationship depends on language group. The first part of this research question was answered in the affirmative. At the end of ninth grade, reading attitudes independently predicted students' reading comprehension after controlling for language group, vocabulary, and word reading ability. Reading attitudes contributed a small to medium effect. The second half of this question was answered in the negative. No significant interaction effects were detected between language group and reading attitudes. Thus, reading attitudes predicted reading comprehension at a single point in time equally for all four language groups.

Research Question 2. The second research question sought to determine whether reading attitudes predicts predict Latino ninth graders' vocabulary after controlling for

language group, prior achievement, and word reading ability and, if so, whether this relationship depends on language group. Both parts of this question were answered in the affirmative. After controlling for language group, prior achievement, and word reading ability at the start of ninth grade (Time 1), reading attitudes independently predicted students' vocabulary scores at the end of ninth grade (Time 2). Reading attitudes contributed a small but statistically significant effect. There was also a significant interaction between language group and reading attitudes, resulting in a medium effect size. While reading attitudes significantly predicted vocabulary growth for English only and reclassified fluent-English-proficient (R-FEP) students, there was no relationship between reading attitudes and vocabulary development among "true" ELs and initially fluent-English-proficient (I-FEP) children.

Language group differences. "True" ELs tended to underperform English only children on measures of reading comprehension and vocabulary. I-FEP and R-FEP students performed equally as well as English only students. However, after controlling for cognitive covariates, I-FEP and R-FEP students significantly outperformed English only students and "true" ELs on the test of reading comprehension. Furthermore, I-FEP and R-FEP students exhibited positive vocabulary growth over the course of the ninth grade school year, while English only and "true" EL children did not.

Findings in Context of Prior Literature

English learners and reading comprehension. Latino English learners have been identified as a student group at risk for reading failure (August & Shanahan, 2006). Consistent with the literature, "true" ELs in the present study underperformed English

only students on measures of both reading comprehension and vocabulary. Many of the students sampled spoke English as a second language but had been classified as fluent-English-proficient after demonstrating competency equal to that of native English speakers. These findings support these students' classifications, as both I-FEP and R-FEP students performed equally as well as English only children on assessments of reading comprehension and vocabulary.

Reading attitudes and reading comprehension. A large number of studies have produced positive correlations between the affective components of reading and reading comprehension (e.g., McKenna et al., 1995; Swalander & Taube, 2007). This trend was continued in the present study. Among the total student sample, recreational reading attitudes was significantly positively correlated with reading comprehension, vocabulary, and word reading ability. The strength of the association was also consistent with that found in prior studies. In a meta-analytic review of 32 studies, Petscher (2010) found that the mean strength of the relationship was .32. In the present study, recreational reading attitudes and reading comprehension were correlated at .29. It should be noted, however, that academic reading attitudes was correlated with neither reading comprehension nor vocabulary at Time 2. This finding was also consistent with prior literature, which has found recreational reading attitudes to be a much better predictor of reading comprehension than academic reading attitudes (Nellenbach, 2010).

A handful of prior studies have sought to determine whether this relationship persists after controlling for cognitive covariates of reading. In fact, researchers have uncovered a significant independent effect for reading attitudes among children in

elementary school (Katzir et al., 2009) and middle school (Conlon et al., 2006; Nellenbach, 2010; Retelsdorf et al., 2011). The present study extended the literature to high school students. The presence of a significant independent effect for reading attitudes suggests that reading attitudes is a significant contributing factor for children of all ages. Furthermore, many of the students sampled in the present study spoke English as a second language. Just as reading attitudes was relevant for first native English speakers in the prior literature, it was also important for second language learners in this study, as long as cognitive covariates were controlled.

Reading attitudes and language skill development. A number of studies have been conducted to determine whether reading attitudes influences children's reading comprehension growth over time, although with mixed results (Becker et al., 2010; Guthrie et al., 2007; Kush et al., 2005; Retesldorf et al., 2011). One of the difficulties with such studies is that the mechanisms by which reading attitudes is supposed to influence reading comprehension growth are often unspecified or unsubstantiated. The present study was premised on the theory that positive reading attitudes promotes incidental vocabulary development which in turn increases reading comprehension abilities. Therefore, vocabulary was selected as the dependent variable instead of reading comprehension because it was theoretically "closer" to the predictor. As expected, the results showed a small but significant relationship between reading attitudes and vocabulary growth. This finding is consistent with earlier studies linking affect and reading comprehension development because vocabulary and reading comprehension are

highly related outcomes (vocabulary being the strongest predictor of adolescents' reading comprehension).

Differences among language groups. Some literature suggests that the relationship between affective components of reading and reading comprehension may hold for some ethnic and language groups but not others. For example, Baker and Wigfield (1999) found a stronger relationship among White children than among Black children, and Unrau and Schlackman (2006) found a relationship among Asian students but not Hispanics. Similarly, Netten et al. (2011) found that affective components of reading predicted reading comprehension growth for first language learners but not for second language learners. In the present study, reading attitudes predicted reading comprehension at a single point in time for all four language groups. However, consistent with Netten et al.'s (2011) findings, reading attitudes only predicted vocabulary growth in the present study among first language learners and those who had been reclassified as fluent-English-proficient.

Relationships among cognitive covariates of reading. Prior literature has found vocabulary to be a key predictor of ninth graders' reading comprehension scores (e.g., Cromley & Azevedo, 1997). Vocabulary is a key ingredient in the reading comprehension of English learners in elementary school (e.g., Proctor et al., 2005). This relationship generally held true for adolescent English learners in the present study. Among the total sample, vocabulary and reading comprehension were highly correlated (with coefficients ranging from .65 to .78), and vocabulary explained the highest proportion of the variation in students' reading comprehension scores. Surprisingly, the

bivariate correlation between vocabulary and reading comprehension was nonsignificant among "true" ELs. This was inconsistent with prior literature, as Proctor et al. (2005) found a correlation of .73 between reading comprehension and vocabulary among English learners in fourth grade, and Droop and Verhoeven (2003) found correlations ranging from .43 to .77 for immigrant children in the Netherlands. However, this non-significant relationship appeared to be the function of the weighted analysis as well as two bivariate outliers. A subsequent unweighted analysis found a significant correlation of .60, which was consistent with prior literature.

Word reading ability has also been demonstrated to predict reading comprehension among both adolescents and elementary-aged English learners, even after controlling for vocabulary (e.g., Ehrlich et al., 1993; Verhoeven and van Leeuwe, 2012). In the present study, word reading ability measures explained significant additional variation in children's reading comprehension outcomes. Word recognition and word decoding were largely redundant, with word recognition being more highly correlated with reading comprehension. However, among "true" ELs, there were no significant correlations between reading comprehension and any of the three word reading ability measures. The latter finding was inconsistent with prior literature, which found word reading ability to be especially important among second language learners (e.g., Proctor et al., 2005).

Finally, prior literature has suggested that word reading ability promotes vocabulary acquisition by increasing readers' access to context clues (McKeown, 1985; Swanborn & DeGlopper, 2002). However, in the present study, word reading ability did

not significantly predict vocabulary development. Once language group and prior achievement were controlled, children of varying word reading abilities developed their vocabularies at the same rate.

Potential Theoretical and Methodological Explanations for the Results

Research Question 1. As predicted, reading attitudes was associated with ninth graders' reading comprehension outcomes even after controlling for language group and cognitive components of reading. This finding is consistent with the work of Ainley et al. (2002) which suggests that there is a behavioral pathway between affect and comprehension. In the present study, it could be that students who found reading to be intrinsically gratifying were more likely to read all the way to the end of the passage. If so, they were therefore able to answer more questions correctly than the students who gave up part way through the passage.

Students' reading attitudes may also have influenced their implicit use of effective reading strategies, a theory previously advanced by Wang and Guthrie (2004). A reader with a more positive attitude may approach one of the test passages already making predictions about what the passage will be about. This activates prior knowledge and makes it easier for the reader to make connections while reading. Since the reader is engaged and expecting to make meaning from the material, he will notice more easily when his comprehension begins to lag. This promotes the use of questioning, which drives the reader to re-read for key information. In contrast, a reader with a more negative attitude may employ few if any metacognitive processes. Since such individuals

are not expecting to make meaning from the passage, they are less likely to notice when their level of comprehension is quite poor.

Finally, the design of the test may systematically bias the results against readers with poor attitudes. After reading the questions, the examinee has the freedom to go back and review the passage in order to find the answers. A student with a poor reading attitude is by definition predisposed to avoid this activity. This may create the impression that this individual's comprehension skills are weaker when, in fact, this student would have achieved a higher score if he had taken the time to go back and read the passage again. On the other hand, a student with a good reading attitude may not mind reviewing the passage in order to gain a deeper understanding of the content.

It is important to consider why there were no reading attitudes-language group interaction effects when predicting reading comprehension at a single point in time. The first research question was premised on the theory that a good reading attitude promotes positive reading behaviors and catalyzes the use of implicit reading strategies. However, these behaviors are only useful if the reader possesses sufficient basic reading skills to tackle the passage. This likely explains why prior studies only found a positive effect for reading attitudes for native English speakers (Netten et al., 2011). The difference in the present study is that vocabulary and word reading ability were controlled. Therefore, all of the students benefitted equally from a good reading attitude, whether or not English was their second language.

After plotting the model residuals against the predicted values, there appeared to be a higher concentration of negative residuals near the low to middle range of the

predicted values (see Figure 4.2). This error may have been caused by behavioral factors above and beyond those explained by (or unexplained by) reading attitudes. Over a period of hours, students completed lengthy assessments of reading attitudes, academic motivation, grammar, vocabulary, and reading comprehension. Thus, some students may have given their best effort to earlier tests but then gave less effort to the reading comprehension test. This type of testing fatigue was highlighted as a limitation in a similar study containing multiple group-administered reading measures (Speece et al., 2010). Furthermore, since the word reading ability measures were administered individually and at a different time, the model's estimate may be closer to the student's "true" reading comprehension ability with the negative residual reflecting instead error associated with the testing protocol.

Research Question 2. As expected, reading attitudes independently predicted vocabulary after controlling for language group, prior achievement, and word reading ability. While reading attitudes only explained a small amount of additional variation in vocabulary at Time 2, it is important to point out that, after controlling for language group and prior achievement, there is very little variation left to explain. In fact, the complete model explains 78% of the variation in a measure that has an internal reliability of .87. Since reading attitudes is a predictor of vocabulary growth, this finding suggests that reading attitudes is associated with behavior conducive to vocabulary acquisition, at least for some students.

Researchers and practitioners have commonly assumed that reading frequency mediates the relationship between reading attitudes and reading skills development, but

this supposition has not been supported in the empirical literature (Becker et al., 2010; de Naeghel et al., 2012; Schiefele et al., 2012; Wang & Guthrie, 2004). While the students with positive reading attitudes may not have encountered more text than those with negative reading attitudes, they may have behaved differently when they did encountered text. For example, positive reading attitudes might promote the use of context clues to decipher unknown words. Since this behavior would likely be conducive to implicit vocabulary acquisition, differences in students' reading attitudes may help account for why some students would learn new words while others would not, even when they have encountered the same volume and quality of print.

One of the most interesting findings in this study was that the relationship between reading attitudes and change in vocabulary was dependent on language group. Somewhat consistent with Netten et al. (2011), reading attitudes predicted change in vocabulary for English only children and R-FEP students, but not for "true" ELs or I-FEP students. Since reading attitudes is theorized to be associated with incidental vocabulary acquisition during text exposure, it would make sense that this relationship would hold for English only and R-FEP children. Both of these groups will encounter a large volume of print during high school, while a much smaller proportion of their vocabulary learning will be the result of explicit instruction. On the other hand, because of their specialized instructional program, "true" ELs will encounter a much narrower range of print at school while receiving more focused instruction on basic language development. Therefore, they are likely to acquire a much larger proportion of their written English vocabulary through explicit means rather than incidental means.

This explanation, however, does not account for why the vocabulary development of I-FEP students would not similarly benefit from the presence of positive reading attitudes. I-FEP students were consistently exposed to the same instruction as English only students, and their reading comprehension skills are just as good. The most obvious difference between these groups is that the I-FEP children are speaking English as a second language (albeit proficiently) while the English only children are native English speakers. This may result in more deliberate and thoughtful interaction with English texts, systematically catalyzing the same productive reading behaviors that only motivated native speakers routinely employ. This would explain why I-FEP students scored significantly higher on the vocabulary test at the end of ninth grade than they did at the beginning of ninth grade.

Language group differences in reading comprehension. English only, I-FEP and R-FEP students all scored equally well on the test of reading comprehension. This finding supports the classification system used by the school, as the latter students were reclassified based on the determination that they possessed English language skills equal to those of a native speaker. As expected, "true" ELs scored somewhat lower on the reading comprehension test than did English only students. While it may seem surprising at first that the observed distinction was not more pronounced, it is helpful to remember that the "true" ELs represent a somewhat heterogeneous groups, with some students functioning near or at the level of English only children but who are still awaiting reclassification. Since CELDT testing is administered annually in most cases, a significant amount of time may pass before reclassification occurs.

After controlling for cognitive covariates of reading (i.e., vocabulary and word reading ability), the difference in the reading comprehension of English only children and that of "true" ELs disappeared. This suggests that these foundational skills account for the observed difference in these student groups' performance. However, the test was not timed, which means that this model does not control for test completion time. Since English learners commonly need extra time to process language and formulate their responses (Hagan, 2010), a timed test may have produced different results.

Interestingly, after controlling for vocabulary and word reading ability, I-FEP and R-FEP students consistently demonstrated better reading comprehension skills than their English only counterparts. Since these students all possess some level of Spanish language knowledge, it is possible that these students are able to leverage their bilingual abilities in order to improve their reading comprehension in English (August, Carlo, Dressler, & Snow, 2005). However, since the present study contains no data on the students' Spanish language abilities, it is not possible to test this supposition. Another possibility to consider is that, since the R-FEP students had been placed in special English learner classes prior to their redesignation, they may have received more explicit instruction in reading comprehension strategies. However, this would not explain the advantage for I-FEP students since they had received the same general instruction as English only students since their initial enrollment in school.

Language group differences in vocabulary. Similar to reading comprehension, there were no significant differences in the vocabulary scores of English only children and those of I-FEP and R-FEP students. This further supports the classification system in

use by the school, as the reclassified children are expected to have English language skills equal to those of a native speaker. Also unsurprising is the significant gap between the vocabularies of English only children and "true" ELs. Many of the "true" ELs are still in the early stages of language acquisition and English vocabulary development is one of their primary tasks. As these students approach reclassification, this gap should be expected to narrow.

One notable observation was that only I-FEP and R-FEP students experienced vocabulary growth over the course of the ninth grade school year, while the vocabularies of English only children and "true" ELs remained stagnant. It is possible that R-FEP students received more explicit instruction in vocabulary development before their reclassification, although the same could not be said of the I-FEP children who had always received mainstream instruction. It is also possible that the bilingual abilities of the reclassified students may have been leveraged to promote vocabulary acquisition. For example, their knowledge and activation of Spanish-English cognates may have helped these students to more efficiently assimilate new English words (Ware, 2011). Since the school's population was overwhelmingly Latino, English teachers may have routinely emphasized this strategy to the exclusive benefit of bilingual students.

The positive but nonsignicant change in "true" ELs' vocabularies could have been partly due to the difficulty level of the vocabulary test. Since the vocabulary test was written at roughly a ninth grade reading level, the "true" ELs may have acquired many new words that were simply too "easy" to have been assessed on the test. On the other hand, it is alarming to see no growth, on average, in the vocabularies of English only

children. This deficiency cannot be attributed to poor instruction since I-FEP and R-FEP students advanced in the same instructional program. Instead, it appears that tertiary factors explain why the vocabularies of certain English only children developed during ninth grade while those of the majority did not. Since the full model revealed a significant relationship between reading attitudes and English only children's vocabulary development, this suggests that these students' reading attitudes are related to the behaviors that facilitate growth.

Implications.

Reading attitudes and reading comprehension. It is important for practitioners to have a tempered view of the role of affective components of reading. On the one hand, it is easy to dismiss affective components entirely while placing the emphasis exclusively on cognitive components, such as background knowledge or academic vocabulary. However, this erroneously assumes that students' interest, attitudes, and motivation will have no bearing on their successful comprehension of an encountered text. On the other hand, it is tempting for frustrated practitioners to completely blame affective factors for their students' poor reading outcomes, insisting that students' comprehension is weak because they "don't care" or because they "just aren't motivated."

In this present study, reading attitudes explained a small but significant amount of additional variance in reading comprehension. In other words, reading attitude mattered, but successful reading comprehension was much more dependent on foundational reading skills. This means that well-equipped students are likely to demonstrate their abilities on a reading test, even if they are not favorably disposed toward the task. Conversely, a

positive attitude toward reading is unlikely to have an enormous impact on the reading outcomes of children with limited vocabularies and poor word reading abilities. A high school science teacher, for example, may desire for students to read and understand a particular text about mitosis. Given the hypothetical choice, it would be better for students to approach this passage with a knowledge of key vocabulary words than for them to simply enjoy reading about science.

While structured interventions have demonstrated moderate effects for various aspects of intrinsic reading motivation (Guthrie, McRae, & Klauda, 2007), reading experts commonly encourage teachers to foster a love of reading in their students in everyday practice (Powell-Brown, 2006). For example, teachers are encouraged to select books with characters and situations that students can relate to or to read to their students during class to demonstrate that reading can be fun or interesting. Likewise, culturally relevant texts have been demonstrated to increase reading enjoyment among "at-risk" minority students (Rickford, 2001). Since the results of this study do generally support this practice (although not at the expense of basic skills development), teachers should consider employing reading attitudes surveys as a yardstick against which to measure the effectiveness of attitudes-oriented interventions.

Interestingly, a number of prior studies raised the specter that reading attitudes might not be relevant to the reading comprehension of certain minority groups, such as African-Americans (Harris, 2009) and Hispanics (Unrau & Schlackman, 2006). Therefore, the lack of a language-group interaction effect should be especially meaningful to practitioners. In the present study, nearly all of the students sampled were

Latinos, and most of them spoke English as a second language (to some degree of proficiency). This suggests that educators of Latino adolescents and specifically educators of English learners should be equally concerned about their students' reading attitudes since it may affect their students' effectiveness as readers.

Presumably, there is some behavioral pathway between reading attitudes and reading comprehension that transcends ethnicity and language group. This pathway is theorized to include the implicit use of metacognitive reading strategies, behaviors that can be turned on and off like a switch, immediately changing the reading outcome. Such cognitive processes should be of key interest to practitioners, because they can be explicitly modeled and taught (Dehn, 2008, p. 292). Thus, a student with a negative reading attitude may be able to simulate the behavior of a student with a positive reading attitude in order to achieve a favorable comprehension outcome in a specific instance. A wide body of literature on reading comprehension strategies is available, and evidence-based strategies include monitoring for understanding, rereading poorly understood text, visualization, and previewing (pp. 293-294). However, it will likely be difficult to maintain these behaviors in other settings since they are more naturally associated with intrinsic rather than extrinsic motivational factors.

Finally, it should be noted that the model did tend to overestimate the reading comprehension scores of children in the mid to low range of predicted values. Therefore, practitioners should be aware of situational factors which could hamper the performance of students of average reading ability. These might include distractions in the classroom, students' mood, or disparities in extrinsic motivation. Given the wide range of possible

negative influences, educators may consider discussing the issue openly with their students, as some of these issues might be easy to ameliorate (e.g., making changes to the class seating chart). Furthermore, given these potential threats to validity, these results should also serve as a reminder not to make high-stakes decisions on the basis of a single test score (American Psychological Association, 2013).

Reading attitudes and vocabulary growth. This study provided some useful insight into how to respond to stagnant vocabulary growth, as reading attitudes was strongly related to vocabulary development for English only students. The fostering of positive reading attitudes may result, for some students, in a slow but steady increase in incidental vocabulary acquisition. Practitioners considering such interventions would be wise to include a standardized measure of vocabulary as a long-term dependent variable.

This study does not offer much help to educators of English learners who seek to promote their students vocabulary development, as reading attitudes was unrelated to their vocabulary growth during ninth grade. However, since the English learners in this study seemed to naturally outpace their English only counterparts in vocabulary growth, practitioners should consider the role that Spanish language skills may play in the acceleration of English vocabulary acquisition. Providing strategies designed to explicitly leverage these native language abilities may be especially fruitful, as second language learners often do not spontaneously recognize cognates (August et al., 2005).

Limitations

Sample selection. The sample in the present study was limited to a single high school in a single school district. It is possible that some of the study's findings may be

due to idiosyncrasies in this particular population. For example, while English only children at this school site attained, on average, no significant vocabulary growth during ninth grade, this could have been the result of a particular school culture or set of common instructional practices. Had additional school sites or school districts been included in the sample, it would have been possible to control for between-group differences through the use of multi-level modeling. Likewise, the inclusion of additional Latino communities in the sample would have increased the external validity of the study since it cannot be assumed that the Latino students in this school are representative of all Latino high school students in the United States.

The sample size utilized in this study was relatively small. This precluded the use of more advanced analytic techniques because the sample size would not have provided sufficient statistical power. Also, the small sample size limits the generalizability of the study. Since the study evaluated differences between four different language groups, this meant drawing broad conclusions based on only about 30 students per group. While the use of small sample sizes is not unusual in this field of research, a larger sample would certainly boost confidence in the results.

There were also limitations associated with the language groupings of the sample. For example, the groups did not take into consideration the students' level of Spanish proficiency. It would be possible for a "true" EL to have completely forgotten his first language before being reclassified as fluent-English-proficient. Similarly, the language groupings did not account for the amount of time a particular student spent as a "true"

EL. Some might have spent five or more years in specialized instruction while others may have just recently begun the process of learning English.

Study design. It is important to point out that regression designs are correlational in nature and causal inferences should generally be avoided. While these models were carefully grounded in both theory and prior literature, a different researcher could conceivably construct a competing but equally convincing model. In order to claim that reading attitudes definitively causes changes in reading comprehension and vocabulary acquisition, it would be necessary to somehow experimentally manipulate this construct. Unfortunately, it would probably be difficult to do so without also manipulating potential confounds (e.g., reading amount or prior knowledge).

Another limitation of the design was the use of multiple regression analysis in place of a more sophisticated statistical technique, such as SEM. First, multiple regression analysis only allows for the modeling of a single dependent variable. SEM or path analysis would have allowed for the simultaneous modeling of multiple dependent variables. Second, multiple regression analysis requires group interaction effects to be modeled through the use cross-product terms created from dummy variables. In contrast, structural equation modeling allows for potential differences in all model parameters to be directly tested in a multi-sample analysis. Finally, some authors have placed an emphasis on the bidirectional relationship between reading attitudes and reading comprehension. SEM would have allowed for this feedback loop to be explicitly modeled, while a multiple regression model assumes untenably that this relationship is solely unidirectional.

Another limitation of the study design, particularly in regard to the second research question, was that it only contained data from two time points. Growth measurement would have been greatly improved if panel data had been collected over a larger number of occasions because the details of the individual growth trajectories would have become much clearer (Willett, 1989a). If additional data had been collected (over the summer, for example), it would have been possible to determine whether each student was growing at the same rate for all of time or whether more complex, nonlinear growth was occurring. This would have made the results more compelling methodologically and more interesting substantively.

Instrumentation. There were a number of study limitations related to the available instrumentation. First, both dependent measures were group-administered in a large standardized testing environment. This introduces error that cannot be modeled. For example, if one student finishes early, it could influence other students to hurry in order to finish also. Similarly, it is not possible to assess each individual student's level of attentiveness during the exam. However, in an individual testing situation, each examinee's undivided attention is maintained and incidental distractions are limited that that student only. The study would have been stronger if both individual and group administered measures had been used, as this would have controlled for environment-related error and provided insight into the comparative role of reading attitudes in each type of testing situation.

When attempting to model growth, it is highly preferable to use carefully scaled scores (e.g., grade equivalent scores) rather than raw scores. In the present study, both

dependent variables were represented by raw scores. Since the test items increase in difficulty as the test progresses, each item is not technically "worth" the same amount. Two students who earn the same score could actually have different ability levels based on which items were answered correctly. Therefore, it is more difficult to be confident when talking about change.

Finally, this study assessed reading attitudes, which is only one of several affective components of reading. Unfortunately, the attitude, interest, mood, and motivation literature have developed in isolation from one another, so it is difficult to make direct comparisons between studies. In this study, it was assumed that the recreational reading attitudes construct was conceptually similar to intrinsic reading motivation. This justified the borrowing of theory from the reading motivation literature in order to present a cohesive narrative for the present study. It would have been useful to include a measure of intrinsic reading motivation in order to test whether these constructs are actually correlated.

Variable selection. There are multiple variables which would have been useful to include in this study, but that were not available. Additional control variables in the model for Research Question 1 would have more convincingly isolated the influence of reading attitudes on reading comprehension. Since reading attitudes has been theorized to increase metacognition, a measure of strategy use would have been a helpful cognitive covariate. Since there is a concern that reading attitudes could partially be a function of perceived competence, a measure of reading self-efficacy would have been a useful affective covariate. Other variables which have been shown to explain variance in

adolescents' reading comprehension scores (e.g., background knowledge, instructional differences) would probably be useful covariates, as well.

In respect to the second research question, it would have been useful to include a measure of reading frequency as a covariate. Even though reading frequency has not been demonstrated to mediate the relationship between reading attitudes and reading comprehension (Wang & Guthrie, 2004), it would have helped clarify potential differences between language groups (specifically, whether English only students engaged in more recreational reading outside of school). It would have also been helpful to model other factors potentially influencing students' vocabulary development during the school year, such as differences in instruction. Finally, since bilingual status has been proposed as a possible explanation for the accelerated word acquisition of I-FEP and R-FEP students, it would have been useful to include a measure of Spanish language ability for those students who spoke English as a second language.

Directions for Future Research

Researchers seeking to understand the complex nature of adolescent reading comprehension should include both cognitive and affective components of reading in their future statistical models. However, the inclusion of affective components should be theoretically driven. That is, researchers must be deliberate about explaining the behavioral pathways that are theorized to bridge the gap between positive affect and better reading comprehension outcomes. These connections should never be assumed or loosely implied. Furthermore, there must be a clear delineation between "real-time" effects associated with increased engagement and developmental effects associated with

changes in foundational reading skills over time. This distinction is especially important in light of the present findings, as the latter was language group-dependent while the former was not.

Future research should also do a better job of integrating different affective constructs in order to build a common literature. It seems inefficient for the same studies to be repeated again and again with recreational reading attitudes, academic reading attitudes, intrinsic reading motivation, extrinsic reading motivation, situational interest, individual interest, and so forth. It is recommended that related constructs be unified based on factor analytic evidence congruent with the cognitive and behavioral mechanisms they are theorized to activate. If, for example, recreational reading attitudes, intrinsic reading motivation, and individual interest are all theorized to improve student engagement, it would be useful to include all three measures in the same study with additional corroborating evidence, such as teacher-reported measures or qualitative assessments.

Adolescent English learners are a growing, at-risk student population in the United States. Therefore, additional research should be conducted exploring the nuanced role that reading attitudes plays in these children's reading comprehension and literacy development. Larger samples of language groups from multiple school sites should be obtained in order to increase generalizability. Additionally, a finer differentiation should be made between CELDT groups because the influence of reading attitudes could be qualitatively different for students who are just beginning to learn the English language than it is for "true" ELs who are very close to being reclassified. English learners may

also be differentiated based on socioeconomic status, first- or second-generation immigrant status, and level of acculturation. Measures of English learners' primary language abilities also should be obtained in order to determine what influence they might have on students' English reading outcomes.

Finally, future research should explore other behavioral variables that could be influencing adolescents' reading comprehension test scores. The model used in the first research question tended to overestimate the reading comprehension scores of students in the low to mid ability range, raising concerns about the validity of the test. This is important to note because high-stakes state-mandated tests are similar in format to the one used here and are administered in a like manner. If the dependent measure in this study is systematically misestimating the ability level of some students, the same could also be true of similarly-designed state tests (particularly in the domain of English language arts), resulting in gross errors in program evaluation and student placement.

Conclusion

Mounting evidence suggests that affective components of reading should be seriously considered alongside popular cognitive variables when constructing models of reading comprehension. This study extended the literature by demonstrating the importance of reading attitudes to the reading comprehension of Latino adolescents. Not only did reading attitudes exert a small but significant effect on reading comprehension at a single point in time, but it also independently predicted students' vocabulary development from fall to spring of ninth grade. These findings were consistent with the theory that a positive reading attitude increases the reader's engagement and catalyzes the

use of implicit reading strategies. These associated behaviors may also increase students' incidental vocabulary development as texts are encountered over time. However, the relationship between reading attitudes and vocabulary development did not hold true for un-reclassified English learners. These findings suggest that practitioners should make a continued effort to monitor and deliberately bolster their students' reading attitudes, without regard for ethnic or linguistic demographics.

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Appendix
Modified ERAS

Directions: Answer the following questions by choosing the number that best represents how you feel.

4 = Makes you very happy
3 = Makes you slightly smile
2 = Makes you mildly upset
1 = Makes you very upset

1. How do you feel when the teacher asks you questions about what you read?**
2. How do you feel about reading textbooks pages and worksheets?**
3. How do you feel about reading in school?**
4. How do you feel about getting a book as a present?*
5. How do you feel about reading for fun at home?*
6. How do you feel about starting a new book?*
7. How do you feel about reading during summer vacation?*
8. How do you feel when you read out loud in class?**
9. How do you feel about going to a bookstore?*
10. How do you feel about taking a reading test?**

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* ERAS-R subscale item

** ERAS-A subscale item