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Component Skills of Reading and Writing
in Spanish-Speaking English Learners

A dissertation submitted in partial satisfaction of the requirements for the degree
Doctor of Philosophy

in
Language and Communicative Disorders

by
Darin King Woolpert

Committee in charge:

University of California, San Diego

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Professor Keith Rayner

San Diego State University

Professor Judy Reilly, Chair
Professor Sonja Pruitt
Professor Betty Samraj

2012
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Chair

University of California, San Diego
San Diego State University
2012
Dedication

To my wife: for the ceaseless support she has provided during this process, and for loving me better than anyone else.

To my daughter: for irrevocably altering my outlook for the better. I am so eager to meet the person you will become.
Epigraph

At one magical instant in your early childhood, the page of a book--that string of confused, alien ciphers--shivered into meaning. Words spoke to you, gave up their secrets; at that moment, whole universes opened. You became, irrevocably, a reader.

- Alberto Manguel

If you can read this, thank a teacher.

- Unknown

Outside of a dog, a book is man's best friend. Inside of a dog it's too dark to read.

- Groucho Marx
Table of Contents

Signature Page ........................................................................................................... iii
Dedication....................................................................................................................... iv
Epigraph......................................................................................................................... v
Table of Contents........................................................................................................ vi
List of Abbreviations .................................................................................................. xi
List of Tables ................................................................................................................ xii
List of Figures ............................................................................................................... xiii
Acknowledgements .................................................................................................... xiv
Curriculum Vitae ........................................................................................................ xviii
Abstract ..................................................................................................................... xx

Chapter 1 ....................................................................................................................... 1
Literacy in Monolingual and Bilingual Populations .................................................. 1
  Organization of the Dissertation .............................................................................. 2
  Rationale for the Studies Described ......................................................................... 3
  SEB Children in the U.S. ......................................................................................... 6
  Defining Bilingualism and the “Categorical Variable” Problem ............................... 9
  Home and School Variables and Their Effect on Language and Reading ............. 11
  Matthew Effects in Reading .................................................................................... 14
  Early Reading Development ..................................................................................... 17
  Phonologically-Centered Frameworks of Reading ................................................. 18
  The Role of Phonological Awareness in SEB Children’s Reading ...................... 19
  Component Frameworks and Non-Phonological Linguistic Factors in Reading .... 24
Questions of Interest – Study 1 ................................................................................... 27
  The Role of Vocabulary in Bilingual Reading ......................................................... 28
  The Bilingual Lexicon .............................................................................................. 29
  The Relationship of Spoken and Written Language and the Dual-Route Model .... 29
  The Dual-Route and Reading in Children ................................................................. 30
  The Lexicosemantic Component of Childhood Reading ........................................ 32
Lexical Processing in Bilingual Adults .................................................................... 34
Lexical Processing in Bilingual Children .......................................................... 42
Questions of Interest – Study 2 ............................................................................... 45
The Need for Research on Writing in Bilingual Children ........................................... 46
Development of Writing Ability in Monolingual Children ............................................ 48
The Link Between Spoken Narratives and Literacy ..................................................... 49
Development of Writing Ability in Bilingual Children .................................................. 51
Analysis of Written Narratives .................................................................................... 54
Summary of Narrative Measures .................................................................................. 56
Questions of Interest – Study 3 .................................................................................... 57
Chapter 2 .................................................................................................................... 58
The Effects of Demographic Variables on Language and Literacy in Spanish-English Bilinguals ................................................................. 58
Abstract ...................................................................................................................... 59
Overview ...................................................................................................................... 60
Early Development of English Reading in Monolingual Children ............................... 61
The Reading Profile of Bilingual Children .................................................................... 62
The Development of Reading ....................................................................................... 63
The Impact of Demographic Factors on Reading .......................................................... 64
Questions Explored By the Current Study .................................................................... 66
Participants .................................................................................................................. 67
Demographic Measures ............................................................................................... 68
Behavioral Measures .................................................................................................... 69
Standardized Measures ................................................................................................. 70
The Fluency Measure .................................................................................................... 71
Analyses ....................................................................................................................... 73
Results .......................................................................................................................... 75
The Omnibus Analysis ................................................................................................. 75
The SES Analysis ......................................................................................................... 78
Discussion ...................................................................................................................... 79
Initial Reading Skills of Monolingual and Bilingual Children ........................................ 81
Chapter 4 ................................................................................................................................. 118
Written Expression in Early Readers .................................................................................. 118
Abstract ................................................................................................................................. 119
Overview ............................................................................................................................... 120
Written Development in Monolingual Children ................................................................. 121
Written Narratives in Bilingual Children .......................................................................... 122
The Link Between Reading, Spoken Narratives, and Written Narratives ..................... 123
Demographic Variables in Bilingual Children .................................................................. 124
Hypotheses ............................................................................................................................ 126
Method .................................................................................................................................. 126
Transcription and Coding ................................................................................................. 129
Analyses ................................................................................................................................ 135
Results .................................................................................................................................. 137
Effects of Grade ................................................................................................................... 138
Effects of Linguistic Status ................................................................................................. 139
The SES-match Analysis ......................................................................................................... 141
Discussion ............................................................................................................................... 142
The Effects of Linguistic Status on Writing Ability ............................................................. 143
The Effect of Socio-Economic Status on Writing Ability ..................................................... 146
Conclusions ............................................................................................................................ 148
Chapter 5 .................................................................................................................................. 149
Discussion and Conclusions ................................................................................................. 149
Overview ................................................................................................................................ 150
Demographic and Linguistic Factors of Literacy ................................................................ 151
The Role of Vocabulary in Bilingual Reading ........................................................................ 154
Written Expression in Early Readers .................................................................................... 155
The Literacy Profile of Bilingual Children ............................................................................ 156
The Impact of Demographic Factors on Language and Literacy ......................................... 160
The Bilingual Advantage for Spanish-English Bilingual Children ........................................ 161
The Bilingual Lexicon in Development ............................................................................... 162
Practical Applications of the Findings ................................................................. 163
Future Directions ................................................................................................ 167
Conclusions ........................................................................................................... 169
References ............................................................................................................. 170
List of Abbreviations

ME ................................................................................................... monolingual English
NCLB ............................................................................................... No Child Left Behind (law)
NDW ............................................................................................. number of different words
PLLF .............................................................................................. proportion of literate language features
PPPSE ........................................................ proportion of phonologically-plausible spelling errors
SEB ........................................................ Spanish-English bilingual
SES ........................................................ socio-economic status
tTTR ........................................................ type-token ratio
List of Tables

Table 1-1. Mean reaction times from three experiments in Posnansky & Rayner, 1977. ................................................................................................................................. 33
Tables 2-1 and 2-2. Rubrics for scaling responses for the Frequency of Reading (Reading; left) and Parental Education (Education; right) questions. ....................... 69
Table 2-3. Means and standard errors (SE) for the demographic measures by linguistic status. .............................................................................................................. 76
Table 2-4. Means and standard errors (SE) for the standardized English measures by grade and linguistic status. ................................................................. 76
Table 2-5. Estimated marginal means and standard errors (SE) for the fluency measures broken down by grade and linguistic status........................................ 77
Table 3-1. Means and standard errors (SE) for Accuracy (across conditions). ....... 112
Table 3-2. Mean reaction times in milliseconds by condition, group, and grade...... 113
Table 3-3. Means and standard errors (SE) for differences in reaction time by group. ...................................................................................................................... 114
Table 4-1. N and mean age (with standard error) by linguistic status and grade..... 128
Table 4-2. Means and standard errors (SE) for the productivity and complexity Measures by grade................................................................. 138
Table 4-3. Means and standard errors (SE) for the accuracy Measures by grade. .... 138
Table 4-4. Means and standard errors (SE) for the productivity and complexity measures by linguistic status. ................................................................. 139
Table 4-5. Means and standard errors (SE) for the accuracy measures by group..... 140
Table 4-6. Examples of spelling errors.................................................................. 140
Table 4-7. Examples of morphological errors...................................................... 141
Table 4-8. Means and standard errors (SE) for the productivity and complexity measures by group after controlling for SES. ................................. 142
Table 4-9. Means and standard errors (SE) for the accuracy measures by group after controlling for SES. ................................................................. 142
List of Figures

Figure 2-1. Linguistic group differences for the monolingual (Mon) and bilingual (Bil) groups on the standardized measures. ................................................................. 78
Figure 2-2. Interaction of grade (1 - 4) and linguistic status (Mon = monolingual; Bil = bilingual) for Fluency Time on Task (in seconds). ......................................................... 79
Figure 2-3. Mean performance of the linguistic groups (Mon = monolingual; Bil = bilingual) on the standardized measures after controlling for SES. ......................... 80
Figure 3-1: example trial from the false cognate condition. Children were asked to touch the word that matched the picture (“bread”). .................................................. 115
Figure 3-2. Difference in reaction times (in ms) between Baseline and the Cognate and False Cognate conditions in the Monolingual (Mon) and Bilingual (Bil) groups. .... 116
Figure 3-3. Difference in reaction times (in ms) between the Phonological and Baseline conditions, by grade and linguistic group. .................................................. 117
Figure 4-1. A transcription of a monolingual first grader’s narrative. ......................... 129
Figure 4-2. A coded transcript from a bilingual fourth grade student .................... 134
Figure 4-3. A coded transcript from a monolingual fourth grade student ............... 135
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ABSTRACT OF THE DISSERTATION

Component Skills of Reading and Writing
in Spanish-Speaking English Learners

by

Darin King Woolpert

Doctor of Philosophy in Language and Communicative Disorders
University of California, San Diego, 2012
San Diego State University, 2012

Professor Judy Reilly, Chair

This dissertation explores the literacy abilities of Spanish-speaking bilingual children who are taught in English. They are a growing demographic, accounting for 9% of total enrollment in U.S. schools and 20% of enrollment in California. Their reading difficulties begin in pre-school and appear to persist throughout their academic careers. Literacy acquisition is crucial for both academic and career success.

Bilingual children present an opportunity to study reading acquisition in a typically-developing child who comes from a non-monolingual language environment. In addition, this information can help guide educational policy to provide help where it is needed most. In order to identify areas of need, it is instructive to compare the bilingual children to their monolingual peers. These groups are compared not to belabor differences between them but to uncover areas that seem most vulnerable in
the bilingual children. The monolingual children serve as a necessary reference point to gauge relative strengths and weaknesses in the bilingual children.

Chapter 1 presents an overview of how reading and written expression develop in monolingual children, and how demographic and within- and cross-language factors affect this development. In Chapter 2, demographic and English language factors are explored in a cohort of 67 monolingual and 65 SEB bilingual from first through fourth grades. Chapter 3 is an examination of the impact of words that share form and meaning (i.e., train/tren) or form but not meaning (i.e., pan/pan, which means bread) cross-linguistically on single-word processing in the same cohort. Chapter 4 provides a detailed analysis of the written narrative abilities of a larger cohort of monolingual and bilingual children. In Chapter 5, implications of the results and future directions are discussed.

This dissertation presents a comprehensive exploration of the reading and written expression abilities of bilingual children. The results suggest that demographic variables may be more important than linguistic ones in explaining the reading challenges in the bilingual group. They also serve to highlight areas of particular need in the linguistic profile of the bilingual children.
Chapter 1

Literacy in Monolingual and Bilingual Populations
Organization of the Dissertation

This dissertation is an examination of literacy in Spanish-English bilingual (SEB) children. The specific goal is to explore the reading and writing abilities of SEB elementary school students and their monolingual English (ME) peers. Three approaches were used: a study of environmental and cognitive factors that underpin literacy in the two groups, a psycholinguistic evaluation of lexical processing in those groups, and an analysis of written expression in the children.

In the current chapter, background information pertinent to the three study chapters is presented. The chapter begins with a rationale motivating the research, and then provides a review of the literature on how demographic and linguistic factors that are important to reading impact literacy development in SEB children. This review is pertinent to the first study (Chapter 2), which examines the demographic and linguistic variables associated with literacy in the two linguistic groups (SEB and ME) as well as how the variables interact with each other. The review continues with an examination of how lexical access works in bilingual adults and children as background for the second study. The second study (Chapter 3) uses a psycholinguistic perspective, examining how the SEB children’s unique profile impacts their ability to assign meaning to single words relative to ME children. This chapter also reviews the literature on written narrative development in ME and SEB children, as background to the third study. The third study (Chapter 4) compares the ME and SEB children’s written narratives to evaluate their ability to express themselves in the written domain.
The final chapter discusses and contextualizes the results from the three studies and explores future directions for research.

**Rationale for the Studies Described**

Literacy has been called “the supreme achievement of schooling” (Bialystok, 2007, p. 47). While this may be overstating the case, literacy is undoubtedly crucial for academic and professional success. A high school diploma is required for the vast majority of jobs; in many states, students must pass a linguistically-demanding reading test to get one (e.g., Proctor, Carlo, August, & Snow, 2005). In addition, the written mode is of growing importance for dissemination of information in U.S. society. Skilled reading increases career opportunities and overall knowledge.

SEB children, a growing proportion of students in U.S. schools, appear to have protracted difficulties in understanding and producing written English (Lee, Grigg, & Donahue, 2007; Restrepo & Gray, 2007). The typical SEB child starts pre-school behind her ME classmates in pre-literacy skills ("Head Start FACES 2000," 2003), and lags behind them on nationwide standardized reading tests ("National Assessment of Educational Progress," 2007). Research on literacy in SEB children serves two primary purposes: (1) to index reading development in children who, despite being typically-developing, have less robust linguistic skills than their ME peers, and (2) to identify the areas of particular vulnerability in the SEB children’s reading profile to inform educational policy.

The studies in the following chapters compare ME children to SEB children. Such comparisons are instructive to identify areas of need in the SEB group. However,
previous studies have claimed bilingualism to be a mental handicap that interferes with typical development (Dunn, 1988; Garretson, 1928; Garth, 1928; Harvey, 1949; Mahakian, 1939; Saer, 1923; Tireman, 1930, 1945). We compare the monolingual and bilingual groups not to suggest that the latter is “less than” the former but rather to uncover the areas of greatest vulnerability in the bilingual children. From this perspective, the ME children serve as a necessary reference point to gauge relative strengths and weaknesses in the SEB children.

A significant flaw in many of the early studies comparing bilinguals to monolinguals was that differences in socio-economic status (SES) were neither addressed nor controlled for (Cummins, 1979; Diaz, 1983; Lambert & Tucker, 1972; Sanchez, 1934). Demographic factors such as a child’s home and scholastic environment strongly influence reading outcomes (Alexander, Entwisle, & Olson, 2007; August & Hakuta, 1997; Dickinson & Tabors, 2001; Entwisle & Astone, 1994; Fry, 2005; Goldenberg, Rueda, & August, 2006; Hakuta, Butler, & Witt, 2000; Huey, 1908; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002; Ready, Edley, & Snow, 2002; Sirin, 2005; White, 1982). One of the major goals of the studies presented in this dissertation is to identify the impact of SES on literacy achievement.

Literacy achievement is dependent on linguistic factors, as well. Phonological skills such as phonological awareness (metalinguistic knowledge of the sound structure of words, such as the ability to identify whether two words rhyme) and decoding ability (applying sound-spelling rules to generate the spoken form of written
text) are important, as well as non-phonological linguistic skills such as oral comprehension (the ability to understand spoken language) and vocabulary (August & Shanahan, 2006; NELP, 2008; NICHD, 2000; Snow, Burns, & Griffin, 1998). The relationship of the phonological and non-phonological linguistic skills to reading in SEB children appears to be different than the relationship of these skills to reading in ME children (as discussed later in this chapter).

One possible explanation for this difference may be that SEB children’s other linguistic system (i.e., Spanish) alters the relationship between reading and components of reading. Numerous studies have explored the interaction of bilingual adults’ two linguistic systems, indicating that both languages are active even when only one language is being used (de Groot & Keijzer, 2000; de Groot & Nas, 1991; Dijkstra, 2005, 2007; Dijkstra, Grainger, & van Heuven, 1999; Dijkstra & van Heuven, 2002; Kroll & de Groot, 2005; Schwartz & Kroll, 2006; Schwartz, Kroll, & Diaz, 2007; Schwartz, Yeh, & Areas Da Luz Fontes, under review; Sunderman & Schwartz, 2008; van Hell & Dijkstra, 2002; van Heuven, Dijkstra, & Grainger, 1998). There is a dearth of such research in bilingual children.

Literacy has an expressive component (i.e., writing). A number of studies have examined written expression in ME children (Amiran & Mann, 1982; Aram & Levin, 2001; Beach, 1984; Berninger, 1994; Berninger & Swanson, 1994; Bishop & Clarkson, 2003; "Center for the Study of Writing. Final Report," 1990; Connelly, Campbell, MacLean, & Barnes, 2006; Crowhurst, 1983; Fontaine, 1984; Fox, 1983; Green et al., 2003; Hayes & Flower, 1980; Ivy & Masterson, 2011; Kroll, 1981;
Langer, 1984; Nippold, Ward-Lonergan, & Fanning, 2005; Perera, 1984; Tannen, 1982; Wolf, 1994). Less studied is writing in SEB children. The majority of studies examining the writing ability of SEB children lack sufficient scientific rigor (Fitzgerald, 2006). Chapter 4 presents an in-depth analysis of the writing abilities of SEB children relative to their ME peers.

The research presented here consists of a comprehensive examination of the literacy profile of SEB children from multiple perspectives. In Study 1, a behavioral approach is used to gauge the interrelationships of demographic and linguistic factors and how they affect reading ability. In Study 2, a psycholinguistic perspective is taken to examine how the process of reading differs between SEB and ME children at the word level. In Study 3, a discourse analysis paradigm is employed to evaluate the writing abilities of SEB children. These studies are designed to address three broad research questions:

- How do demographic factors impact language and literacy in SEB children?
- What impact do intra- and inter-linguistic factors have on SEB children’s ability to assign meaning to text?
- How do SEB children compare to ME children in terms of written expression?

SEB Children in the U.S.

This section provides an overview of who the SEB children are. The No Child Left Behind Act (NCLB; Public Law No. 107-110, 115 Stat. 1425, 2002) requires schools to track performance of all students. Bilingual children are defined in the law as those who have a primary language other than English in the home and score below
a set threshold on an English proficiency test\(^1\). These bilingual children come from heterogeneous linguistic backgrounds; more than 300 languages are spoken by children in California public schools alone ("Foreign Language Framework for California Public Schools: Kindergarten Through Grade Twelve," 2003).

The largest group of bilingual students is SEB children, making up 9% of the K-12 population in U.S. schools (August & Hakuta, 1997; Kindler, 2002). Their increasing numbers in the student body is unsurprising: Spanish is the second most common language spoken in the U.S. By some estimates, the U.S. has the second largest number of Spanish speakers in the world, after Mexico ("El Español en Cifras," 2007; "Language Spoken at Home," 2010). According to the recent U.S. Census Bureau report on language use, the number of people who speak Spanish at home in the United States has tripled since 1980 to 34 million (Shin & Kominski, 2010).

SEB children appear to struggle with literacy throughout their scholastic careers. They start behind their ME peers in pre-literacy skills ("Head Start FACES 2000," 2003) and graduate from high school reading at the eighth grade level on average (Donahue, Voekl, Campbell, & Mazzeo, 1999). They are also twice as likely as their monolingual peers to not graduate (Ruiz de Velasco & Fix, 2000). Only 59% of Spanish speakers in the U.S. over age 25 have completed high school, and only 14% have received an undergraduate university degree (Shin & Kominski, 2010).

\(^{1}\) Terms such as “Limited English Proficient” and “English (Language) Learner” are also used in reference to these children.
While the study cited does not report data for ME adults, another study found 85% of ME adults completed high school and 24% received an undergraduate university degree (Fry & Lowell, 2003).

The sources of this disparity are no doubt multi-factorial, owing to differences in demographic as well as linguistic factors. However, low reading achievement is strongly linked to poor educational outcomes as early as third grade (Hernandez, 2011; Lloyd, 1978) and non-graduation rates are more than three times higher for poor readers than skilled readers (Hernandez, 2011; Penty, 1956). In follow-up interviews, Penty (1956) found that the majority of students who did not finish high school cited frustration with reading as the primary reason.

Thus, investigation of reading and writing acquisition in SEB children is critically important, particularly in the early elementary grades, to improve academic outcomes and better serve this growing segment of the population. These findings can inform best-practice in schools for educators and speech-language pathologists in increasing literacy skills and distinguishing language differences from language disorders.

From a theoretical perspective, this information can increase our understanding about an increasingly common sub-type of bilingualism, where children are exposed primarily to one language in the home and another at school, and how outcomes differ relative to children regularly exposed to both languages in both environments. In addition, SEB children present an opportunity to study reading acquisition in a typically-developing child who comes from a non-monolingual language environment.
Defining Bilingualism and the “Categorical Variable” Problem

In the previous section, children were referred to as “bilingual” who meet the definition laid out by NCLB. This section discusses problems with this and other definitions of bilingualism. The term “bilingual” means many different things, and there is no consensus in the literature as to what criteria should be used to distinguish between monolingual and bilingual children. Further complicating matters is the existence of many subtypes of bilingualism. For example, many SEB children in the United States are heritage speakers of Spanish (Montrul, 2006). Heritage speakers typically feel more comfortable in the community language (English) than their family language (Spanish) due to incomplete acquisition or loss of the family language.

Some definitions of bilingualism would exclude heritage speakers for lack of proficiency in the home language. For example, Bloomfield (1933) defined bilingualism as “native-like control of two languages” (p. 53) – a strict definition. This definition contrasts with “knowledge present (to whatever degree) in more than one language” (Valdés & Figueroa, 1994, p. 7), a definition so broad as to count nearly everyone as a bilingual. Other definitions are more subjective, such as Grosjean’s (1989): a bilingual is someone who can function in each of two languages according to given needs.

There is no clear definition of bilingualism. Bialystok (2001a) reviewed the problems with defining the term (see also Diaz, 1983; Romaine, 1995). First, there are different kinds of bilingualism (simultaneous vs. sequential) and different subcategories, such as one person/one language, one environment/one language, two
home languages and a third community language, etc. After underscoring the need for a straightforward definition of bilingualism, Bialystok ultimately acknowledges the task may be impossible: “Having strongly asserted that a proper definition of language proficiency is at the core of investigations of language, we have avoided confronting it…there are no objective tests or accepted standards…The insurmountable problem from a methodological perspective is simply that bilingualism is not a categorical variable” (2001a, p. 19).

Since the current study seeks to have both practical as well as theoretical applications, the criteria of the schools outlined above were used: a home language other than English and a lack of proficiency in English. This definition is as problematic as the previously discussed definitions. One concern with these criteria is the lack of evaluation of the child’s abilities in the home language (in the case of the children in this study, Spanish). As a result, the studies described in Chapters 2-4 included an extra criterion: children who did not meet baseline performance in Spanish were excluded (see Chapter 2).

While linguistic factors are doubtless important in contributing to the reading outcomes of SEB children, there is strong evidence that non-linguistic factors are contributing as well. Data from the fourth grade National Assessment for Education Progress reading assessment show that Asian bilinguals with limited proficiency in English perform better in reading than do ME black children ("National Assessment of Educational Progress," 2007). Since some ethnic groups of children who lack English proficiency can outperform some ethnic groups of ME children, English proficiency
alone is not sufficient to explain English reading outcomes. Differences in home culture and other demographic factors also impact literacy development (Zhou, 2001). The effect of such factors on reading is reviewed in the next section.

**Home and School Variables and Their Effect on Language and Reading**

Children from low socio-economic status (SES) backgrounds are at-risk for reading difficulties, regardless of their linguistic status (Dickinson & Snow, 1987; Snow et al., 1998; Teale, 1986). SEB children are more likely than ME children to come from low-SES homes (August & Hakuta, 1997; Goldenberg et al., 2006; Ready et al., 2002). In this section, how home and school variables impact reading outcomes is reviewed.

There are multiple home environment variables that impact literacy development. For example, Huey (1908) linked quantity and quality of both early book exposure and reading experiences to increased reading achievement over a century ago. This exposure may come through children reading on their own (Juel, 1988) or being read to by a parent or caregiver (Feitelson & Goldstein, 1986; Heath, 1982; Park, 2008; Sénéchal & LeFevre, 2002). The level of a parent’s education and their child’s subsequent linguistic proficiency are strongly tied (Entwisle & Astone, 1994; Hakuta et al., 2000), and highly-educated parents use language structures more likely to be found in the classroom (Dickinson & Tabor, 2001). Maternal speech correlates with lexical (Huttenlocher et al., 1991; Rowe, 2008) and syntactic (Huttenlocher et al., 2002) development in ME children.
An analysis of responses to an international survey indicates that the number of books in the home may be an even stronger predictor of reading outcomes than parental education (Park, 2008). The data from fourth graders in the Progress in International Reading Literacy Study were analyzed and showed a significant effect of number of books in the home on reading achievement, as measured by a reading test designed for the study (no information is presented by Park regarding the design of the test). This effect was robust even when controlling for differences in parental education. A more recent study has shown number of books in the home to be as important a factor as parental education in predicting educational achievement (Evans, Kelley, Sikora, & Treiman, 2010). The number of books in the home is thought to index parental attitudes towards reading rather than being a causal factor in increasing reading and educational achievement (see also Feitelson & Goldstein, 1986; Neuman, 1999).

While the effects of home environment on a child’s educational outcomes are typically significant, they are also modest (Aschaffenburg & Maas, 1997; Scarborough & Dobrich, 1994). Meta-analyses evaluating the impact of SES on children’s reading development indicate that school SES is a much better predictor of literacy achievement than home SES (Sirin, 2005; White, 1982). In other words, living in a low-SES home and attending a high-SES school should lead to better reading outcomes than living in a high-SES home and attending a low-SES school (see also Bryk & Raudenbush, 1987; Walberg & Tsai, 1985).
Research by Alexander and colleagues challenges this conclusion, however (e.g., Alexander et al., 2007). The California Achievement Test was administered to Baltimore school children from low- and high-SES homes at the beginning and end of first through ninth grades. Children from low-SES homes started first grade significantly below their high-SES peers on the reading comprehension sub-test of the California Achievement Test, but made equal gains over the school year. After the summer break, the scores of children from low-SES homes decreased, whereas scores of children from high-SES homes increased. As a result, the differences between the SES groups widened over time. This “summer vacation” effect (for a review, see Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996) was first noted by Heyns (1978).

The differences between the low- and high-SES children in the Alexander study stem from two sources: baseline reading comprehension ability at the start of first grade, and the improvement in reading the high-SES children seen over summer vacation (i.e., when the child is not in school). Both of these effects may be attributed to differences in the home, rather than scholastic, environment. Thus, attending a low-SES school may not be a risk factor for reading difficulties per se, but rather predicts how much time the child spends reading when she is not in school.

The separate contributions of school and home learning to reading ability are difficult to disentangle, however, since school and home SES are confounded with each other (Fry, 2005). In the Alexander study, for example, only 13% of the children from low-SES children homes attended a college-preparatory high school, compared
to 62% of the children from high-SES homes. However, a recent analysis indicated that the three school factors measured accounted for a significant amount of variance in English language proficiency in 274 English learners, even after home and social variables were accounted for (Carhill, Suárez-Orozco, & Páez, 2008). The three factors were English proficiency (percentage of students at proficient or advanced on the English Language Arts standardized test), school poverty (percentage of students receiving a free lunch), and school minority percentage rate (percentage of non-White students attending the school).

Socio-economic status clearly has an effect on reading and academic achievement. Home and school factors both exert a good deal of influence on reading achievement. While school factors impact reading when home factors are taken into account, it is unclear whether home factors impact reading when school factors are taken into account. In the next section, the long-term effects of these differences are evaluated.

**Matthew Effects in Reading**

As mentioned previously, children who are poor readers in third grade are much less likely to graduate from high school than children who are strong readers (Hernandez, 2011; Lloyd, 1978). The majority of children (21/24) who were poor readers when they enter school were still poor readers four years later (Juel, 1988), suggesting similar effects would be seen in first grade students. In many cases, the differences between poor readers and good readers increase with time. This widening achievement gap, as seen in Alexander et al. (2007), is often termed a “Matthew
Effect.” This term comes from the Gospel of Matthew, paraphrased as “the rich get richer and the poor get poorer” (Stanovich, 1986). SEB children are vulnerable to Matthew Effects, given their limited English proficiency and increased likelihood of coming from low-SES backgrounds. Thus, a discussion of Matthew Effects is relevant here.

Stanovich (1986) asserts that deficits in decoding and comprehension can lead to Matthew Effects in ME children, but that the comprehension deficits persist well beyond decoding deficits. Why are comprehension deficits more persistent? Stanovich suggests the persistence of comprehension deficits is due to reciprocal causation: “individual differences in a particular process may cause differential reading efficiency, but that reading itself may in turn cause further individual differences in the process in question” (Stanovich, 1986, p. 378). Stanovich focuses on reciprocal causation in vocabulary. Children are able to learn new words from reading, but this ability depends on their familiarity with the words in the text and the length and density of difficult words (Nagy, Anderson, & Herman, 1987). Thus, a child with a large lexicon is more likely to increase her vocabulary through reading, by inferring the meaning of novel words from context. This expansion of her vocabulary will, in turn, make it easier to read more challenging texts (see also Carver, 1994; Swanborn & de Glopper, 1999). A child with a smaller vocabulary will not receive this lexical benefit from reading because she will not know enough words to infer the meanings of novel words – sometimes termed the “beginner’s paradox” (Coady, 1997).
A four year longitudinal study of 54 low-SES children suggested reading readiness and attitudes towards reading may lead to a different kind of Matthew Effect (Juel, 1988). The students attended a single elementary school in Texas; linguistic status of the students was not addressed, but presumably there was a mix of ME and SEB children in the sample. Asked about reading habits in fourth grade, average and good readers (those who read at or above grade level) read approximately four nights more per week than poor readers, and indicated unequivocally that they liked reading. In contrast, several poor readers reported hating reading, with 40% saying they would rather clean their rooms; one child stated a preference for cleaning mold out of the bathtub. Juel also found that poor readers generally entered first grade with minimal decoding skills, and those who could decode had poor comprehension; 88% of these first grade poor readers were still poor readers in fourth grade. In other words, children who are poorly equipped to learn how to read come to dislike reading, read less, and remain poor readers throughout their schooling. Some of the students may have had language or learning disabilities; Juel did not report evaluating for this possibility. However, 24 out of the 54 students were in the “poor reader” category. This proportion is much higher than would be expected were language or learning disabilities the only cause for the children’s reading problems.

Since SEB children are likely to come from low-SES backgrounds, the known impact of SES on reading should inform research on SEB children. Coming from a low-SES background can lead to deficits in reading that compound with time (Alexander et al., 2007; Cooper et al., 1996; Juel, 1988; Kim, 2004; Stanovich, 1986).
Previous studies suggest that the schools, communities, and peer groups of SEB children are important factors for their reading success (August & Hakuta, 1997; August & Shanahan, 2006; Bryk & Raudenbush, 1987; Fry, 2005; Ruiz de Velasco & Fix, 2000; Sirin, 2005; Slavin & Cheung, 2005; White, 1982; Zhou, 2001), as well as home variables like parental education and early literacy experiences (Dickinson & Tabors, 2001; Entwisle & Astone, 1994; Evans et al., 2010; Feitelson & Goldstein, 1986; Hakuta et al., 2000; Heath, 1982; Huttenlocher et al., 1991; Huttenlocher et al., 2002; Neuman, 1999; Park, 2008; Rowe, 2008; Sénéchal & LeFevre, 2002).

Linguistic factors also strongly impact reading outcomes. In the next section, factors that have been identified in the literature as important for literacy will be reviewed. Subsequently, factor(s) that are vulnerable in the SEB group will be examined.

**Early Reading Development**

A variety of skills have been identified in research as underpinning reading ability. Early on, children must develop print awareness, the ability to discriminate between text and drawings; book awareness, knowledge of how books are laid out (such as which is the front cover, which way to turn the pages, etc.); and phonemic awareness, the ability to identify and manipulate phonemes, such as identifying the number of sounds in a spoken word or adding a sound to the beginning of a word to generate a new word (Snow et al., 1998). Note that phonemic awareness is not a unitary skill but rather a collection of skills (Juel, 1988). Phonemic awareness is also a subset of phonological awareness. The terms phonological awareness and phonemic
awareness are sometimes used interchangeably (Burgess, 2002), although phonological awareness includes abilities such as identifying the number of syllables in a word, which would not be considered phonemic awareness. For the sake of simplicity, I will refer to phonological awareness consistently throughout, even when using the term phonemic awareness might be just as apt.

One of the crucial milestones in literacy development is acquisition of the “alphabetic principle” (for reviews, see Ehri, 2000; Liberman, Shankweiler, & Liberman, 1989; Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001). The alphabetic principle is knowledge that print is intended to represent the spoken forms of words (Ehri, 2000). Before acquiring the alphabetic principle, children may assume that letter strings encode semantic information about their referent, as with the children who spelled “dog” using one letter and “three dogs” using three letters (Bialystok, 1991; Ferreiro & Teberosky, 1982).

**Phonologically-Centered Frameworks of Reading**

A great deal of importance is ascribed to the role of phonological awareness in fostering early reading ability, partly as a response to “whole language” approaches to teaching reading (e.g., Moats, 2007). I will refer to these as phonology-centered frameworks of reading (e.g., Brady & Shankweiler, 1991; Perfetti, 1985; Rieben & Perfetti, 1991; Shankweiler & Liberman, 1989). Phonologically-centered frameworks were generated from research on monolingual children, and focus on the crucial relationship between phonological awareness and decoding, with less attention paid to non-phonological linguistic factors. The correlation between phonological awareness
and decoding appears robust at early ages (Bradley & Bryant, 1983; Shankweiler et al., 1995; Stanovich, 1986).

Further support for the importance of phonological skills to early reading comprehension has come from a number of large-scale meta-analyses of factors that subserve literacy acquisition (August & Shanahan, 2006; NICHD, 2000; Snow et al., 1998). Factors analyzed included phonological skills like phonological awareness, phonics, decoding, and linguistic skills like vocabulary and oral comprehension of spoken English. The meta-analyses found the strongest effect sizes for phonological skills among young children in predicting their future reading ability.

Some scholars have criticized the conclusions of these meta-analyses, with particular concerns being raised regarding comparing widely different domains in a single meta-analysis. While linguistic skills like vocabulary and oral comprehension may not impact reading as strongly in the short term as phonological skills do, and thus not show a large effect size, they provide modest but continuous contributions over the long term (Barnett & Frede, 2009; Dickinson, Golinkoff, & Hirsh-Pasek, 2010). Phonological skills, in contrast, develop rapidly, providing large effect sizes but diminishing returns. Nonetheless, phonological awareness seems a crucial factor in ME children’s early reading development.

The Role of Phonological Awareness in SEB Children’s Reading

Since the phonologically-centered frameworks were developed through research on ME children, it is worth considering how well they apply to SEB children.
These frameworks would predict that SEB children’s reading problems come from lower phonological awareness relative to their ME peers.

SEB children do typically have lower English phonological awareness than ME children. One study asked 22 SEB and 14 ME first graders to identify whether two English words started with the same phoneme, ended with the same phoneme, or rhymed (Cisero & Royer, 1995). The SEB children were quicker but less accurate to respond than the ME children. When English words were played over speakers to 40 ME and 40 SEB kindergarteners, ME children were significantly better at producing the beginning or final phoneme of the word and pointing to it on a letter board (Brice & Brice, 2009). Rolla San Francisco, Carlo, August, and Snow (2006) assessed a group of kindergarten and first grade children on an English phoneme segmentation task. The participants were 45 SEB students receiving Spanish Instruction, 35 SEB students receiving English instruction, and 22 ME students. Both groups of SEB children scored below ME children in phoneme segmentation.

Given the challenges SEB children face with English phonological awareness and how strongly phonological awareness predicts decoding in monolingual children, one might expect that the SEB group will have less decoding ability than the ME group. At this point, the applicability of the phonologically-centered frameworks to SEB children appears to break down. Studies regularly find no difference in decoding between ME and SEB groups. A longitudinal study of 261 SEB children found reading comprehension, but not decoding, to be below age-level based on standardized tests (Nakamoto, Lindsey, & Manis, 2007). Another study of 689 ME and 135
bilingual fourth graders from a variety of linguistic backgrounds (including Spanish) found no significant differences between the two groups in speed or accuracy of word or non-word reading (Lesaux, Rupp, & Siegel, 2007). Thus, there seems to be a disconnect between phonological awareness and decoding in the SEB children.

However, the studies above did not test phonological awareness at the same time they tested decoding. This raises the possibility that the bilingual children tested had atypically robust phonological awareness skills, which is why no differences were seen in decoding between the ME and bilingual groups. A longitudinal study evaluated the decoding and spoken language skills of 727 ME children and 131 bilingual children from diverse linguistic backgrounds (Chiappe, Siegel, & Gottardo, 2002; Chiappe, Siegel, & Wade-Woolley, 2002). Decoding measures included a single-word reading task and a single-word spelling task. Spoken language measures included phonological awareness tasks, a sentence recall task, and a syntactic cloze task (where a child had to provide the missing word in sentences like “Jane ____ her sister ran up the hill.”). In both kindergarten and first grade, no group effects were found on the decoding measures but differences were found on all spoken language measures, including phonological awareness. In this study, the bilingual children had significantly lower phonological awareness than the ME children, but comparable decoding skills. A large-scale Dutch study of 1,812 monolingual first-grade children and 331 of their bilingual peers examined a number of pre-literacy and literacy skills (Verhoeven, 2000). Significant differences between the two groups were found for Dutch spelling, Dutch vocabulary, and Dutch phonological awareness – but not Dutch
decoding. The results of both studies must be qualified, however, as the bilingual children came from diverse linguistic and cultural backgrounds, confounding the results with variability in typological distance between the language of the school (i.e., English or Dutch) and the home languages, as well as possible cultural differences in the home.

How do SEB children fare? A study by Bialystok, Majumder, and Martin (2003) compared ME and SEB children on phonological awareness and decoding. Two decoding measures and three phonological awareness tasks were administered to 25 SEB and 33 ME children. The SEB group outperformed the ME group on one of the phonological awareness measures (a phoneme segmentation task). No significant differences were found for the other tasks. The results of the studies in this paragraph and the one that precedes it suggest problems with the value of phonological awareness in predicting decoding in bilinguals: regardless of whether bilingual children scored significantly below or above monolingual children in phonological awareness, the former group had comparable decoding skills to the latter group. In addition, the results suggest decoding is a robust domain for the bilingual children.

Further evidence that decoding develops at an age appropriate level in SEB children comes from a study assessing 814 SEB and 248 ME children in kindergarten, second, and fifth grade (Oller & Eilers, 2002). The battery of standardized tests administered included vocabulary, word decoding, and non-word decoding measures. SEB children scored below average (based on the norming sample) on the vocabulary measure and significantly below the ME children on vocabulary and word decoding,
although the effect was much larger for vocabulary. The SEB children were in the average range on both decoding measures relative to the norming sample, and there was no difference between the SEB and ME groups on non-word decoding (for further discussion of these results, see Oller, Pearson, & Cobo-Lewis, 2007). Since the two groups performed comparably on the non-word decoding task, the significant difference on the real-word decoding task seems to be due to the lexical status of the words. That is, increased exposure to English words generally is giving the ME children an advantage for reading English words not seen in the non-words. This “lexical effect” on decoding is not surprising given the less robust vocabulary of the SEB children.

In sum, most studies find significant differences between ME and SEB children on a variety of phonological awareness tasks, but no corresponding differences on decoding, as would be predicted by phonologically-centered frameworks. This finding is seen in studies that tested the phonological awareness and decoding of the same children, suggesting that the result is not due to cohort effects. This profile is not compatible with the phonologically-centered frameworks mentioned above that position phonological awareness as the primary factor for early reading success. The most likely explanation for this discrepancy is that the reading profile of monolingual children is not directly generalizable to bilingual children. Phonologically-centered frameworks often assume a robust linguistic system. As Gough and Juel (1991) put it, “the first grade child already knows, in their spoken or phonological form, most of the words that he will encounter in print for the next 3
years” (p. 51). This assumption does not hold for SEB children: evidence for reduced vocabulary in the SEB group was presented earlier (Oller & Eilers, 2002). In the next section, the contribution of non-phonological linguistic factors to reading and whether they are likely to be a cause of reading difficulty for SEB children will be examined.

**Component Frameworks and Non-Phonological Linguistic Factors in Reading**

Despite the focus on phonological skills and decoding in reading research, non-phonological linguistic skills (such as vocabulary) have been found to be better predictors of future reading than decoding ability (Scarborough, 1998; Snow et al., 1998). In this section, I will explore component frameworks, which accommodate both phonological and non-phonological skills. The term “component framework” is borrowed from Joshi and Aaron (2000), and used to describe a variety of frameworks based on the Simple View of Reading (Gough & Tunmer, 1986).

The Simple View describes reading comprehension (R) as the product of decoding (D) and oral language comprehension (C), such that \( R = D \times C \). Oral comprehension is defined as the process of interpreting discourse via lexical information. The Simple View suggests that with no decoding or comprehension ability, reading comprehension cannot take place. It also suggests that reading comprehension will improve as skill in decoding or comprehension improves.

The Simple View was initially proposed without empirical backing. Juel’s study cited above (1988) provided indirect evidence to support it. The 54 children in her longitudinal study were split into good and poor readers and tracked from first to fourth grade. Had any of these children had both good decoding and oral
comprehension along with poor reading, it would have contradicted the Simple View. Instead, all but two of the poor readers in fourth grade had poor decoding; the two who had good decoding had poor oral comprehension. Juel also found that decoding predicted reading comprehension better in earlier grades, and oral comprehension predicted reading comprehension better in later grades.

Further support for The Simple View came from a longitudinal study of first through fourth grade SEB children (Hoover & Gough, 1990). This secondary analysis began with 210 first grade students, 55 of whom were still participating in the study as fourth graders. The children were administered a non-word decoding task and oral and reading comprehension tasks (where they were asked open-ended questions about paragraphs they heard/read, respectively). Both decoding and oral comprehension were significant predictors of reading comprehension. The correlation coefficient between oral and reading comprehension was .46 in first grade and .87 in fourth grade, indicating it was a stronger predictor of reading comprehension for the older children, complementing the results of Juel (1988). In each grade, the product of decoding and oral comprehension better predicted reading comprehension than either decoding or oral comprehension alone. The study provided empirical support for The Simple View and showed the applicability of this framework for SEB children.

The Simple View has been revised and validated further in recent studies (Brimo & Apel, 2011; Joshi & Aaron, 2000; Proctor, August, Carlo, & Snow, 2006; Proctor et al., 2005; Tiu, Thompson, & Lewis, 2003; Vellutino, Tunmer, Jaccard, & Chen, 2007). Joshi and Aaron found that adding reading fluency, or time it takes to
decode, to the Simple View accounted for a significant amount of additional variance in third graders’ reading comprehension. These children were presumed to be ME although Joshi and Aaron indicate that they were not screened for linguistic status. Two studies of 135 SEB fourth graders by Proctor and colleagues found significant contributions for English vocabulary (Proctor et al., 2005) and Spanish vocabulary (Proctor et al., 2006) to reading comprehension. Decoding and oral comprehension were also significant factors in reading comprehension, although oral comprehension was the best predictor of reading comprehension in their cohort. Vellutino et al. (2007) expanded The Simple View to include predictors of decoding and oral comprehension. Predictors of decoding included ability to identify the different phonemes in a minimal pair (e.g., cat/hat) and to spell real words; predictors of oral comprehension included a grammaticality judgment task and a vocabulary task. Participants were 297 second and third grade and 171 sixth and seventh grade children. Students were presumed monolingual although the issue of lingualism was not addressed in the article. Vellutino et al. found their revised model predicted reading comprehension better than The Simple View alone. As with SEB children (Hoover & Gough, 1990), oral comprehension correlated more highly with reading comprehension in the older children of the cohort (see also Brimo & Apel, 2011).

The studies above provide ample support for the Simple View. Since reading comprehension depends on decoding and oral comprehension, and decoding ability is equivalent between ME and SEB children, these frameworks predict oral comprehension to be a vulnerable domain in SEB children. There is evidence to
support this prediction. In studies by Chiappe and colleagues, oral language
comprehension – as measured by a syntactic cloze task and a sentence recall task –
was found to be higher in ME children than in bilingual children (Chiappe, Siegel, &
Gottardo, 2002; Chiappe, Siegel, & Wade-Woolley, 2002). Oller and Eilers’ study
(2002) cited above provides further support for component frameworks. The SEB
children were significantly below the ME children in reading comprehension and all
vocabulary measures, despite robust decoding skills. Non-phonological linguistic
skills such as vocabulary (August, Carlo, Dressler, & Snow, 2005; Carlisle, Beeman,
Davis, & Spharim, 1999; Proctor et al., 2005) and morphological awareness (the
ability to change a word to another part of speech, e.g. nation to national; Kieffer &
Lesaux, 2008) have also been shown to be significant predictors of reading
comprehension in SEB children. The study by Verhoeven (2000) of Dutch children
cited above found that vocabulary was a stronger predictor of reading comprehension
in bilingual children than monolingual children.

Research points to a role for non-phonological linguistic skills in reading
comprehension for SEB children. In addition to the demographic factors discussed
previously, vulnerabilities in linguistic skills may be the major obstacles to mastering
literacy for this group.

Questions of Interest – Study 1

The first study attempts to evaluate the linguistic and demographic factors that
affect reading in SEB children. In particular, the study is interested in the following
questions:
• How do SEB children compare to ME children in terms of linguistic components of literacy during the initial years of reading development?

• How do demographic factors impact language and literacy in SEB children?

A group of first through fourth grade ME and SEB children were recruited. To address the first question, children were administered a battery of standardized and experimental measures of decoding, fluency, vocabulary, and oral and reading comprehension. For question 2, parents were given questionnaires about the language and literacy environment of the home. The questionnaires were used to match children for SES and examine how controlling for demographic factors changed the profile of differences between the two groups. The study is described in further detail in Chapter 2.

**The Role of Vocabulary in Bilingual Reading**

In addition to the behavioral analyses described above, there is great utility in evaluating reading in the SEB children from a psycholinguistic perspective. Such analyses help us understand the mechanisms that underpin literacy and the development of the bilingual lexicon. Study 2 (described in Chapter 3) examines the lexical processing in the SEB group. As background for the study, the following sections review adult models of reading and how they apply to children. Because Study 2 evaluates how words that are form similar across languages (such as cognates and false cognates) impact responses in the bilingual group, research on the processing of such words in adults and children is reviewed.
The Bilingual Lexicon

As mentioned previously, SEB children typically have comparable decoding ability but less robust vocabularies in either of their languages when compared to monolingual peers. In addition, bilingual children have a second lexical system which can impact both their decoding and their reading comprehension in their first language (and vice versa). Study 2 explores how this unique profile impacts their ability to use form to access meaning in written English by way of an online psycholinguistic task.

The Relationship of Spoken and Written Language and the Dual-Route Model

The study in Chapter 3 was designed to examine the spoken-written language relationship at the level of the word. This relationship is fundamental to literacy research and central to theoretical models of reading. The majority of the research has been done on adult readers; less is known about how these relationships begin and change during development.

The most pertinent model of the spoken-written language relationship for our purposes is the dual-route model of reading (e.g., Coltheart, 2005; Coltheart, Curtis, Atkins, & Haller, 1993; Coltheart & Rastle, 1994; Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001). De Saussure was the first to posit such a model (1916; translated 1966), arguing that “we read in two ways. A new or unknown word is scanned letter by letter. But a common, familiar word is taken in at a glance, without bothering about the individual letters: its visual shape functions like an ideogram,” bypassing the spoken form and going straight to the concept the word represents (pp. 33-34).
De Saussure’s theory was not grounded in empirical data. The first empirically-based models of reading were single-route models (Conrad, 1964; Rubenstein, Lewis, & Rubenstein, 1971). Early versions of the dual-route model were hypothesized by Foster and Chambers (1973) and Baron and Strawson (1976). The current version of the dual-route model posits a direct (lexicosemantic) and an indirect (graphophonemic) route for reading (for a review, see Coltheart, 2005). The direct route, used by skilled readers when presented with highly familiar words, goes straight from orthography to meaning. Baron and Strawson (1976) compared this process to reading of logographic writing systems in which each character represents a word rather than a phoneme. The indirect route maps orthography onto phonology using a set of correspondence rules to generate the spoken form of the word. The spoken form is then used to access meaning.

Generated primarily from research on adults, the dual-route model explains single-word reading in typical adult readers, as well as those with brain injuries (Hillis & Caramazza, 1990; Jobard, Crivello, & Tzourio-Mazoyer, 2003; Ogden, 1996; Rapcsak, Henry, Teague, Carnahan, & Beeson, 2007). The next section presents an evaluation of how well it predicts reading in children.

**The Dual-Route and Reading in Children**

For typically-developing children receiving phonologically-based instruction, learning to read goes through predictable stages. Initially, the child has only a single route through which to uncover meaning: the phonological route. Each word must be decoded, letter by letter, sound by sound, and then the sounds must be strung together
to generate the spoken form of the word. This process relies heavily on knowledge of what Gough (1980) termed the “cipher” – sound-spelling correspondences of the child’s native language.

With time, the second (lexicosemantic) route develops and strengthens as the child increases her sight-word repertoire. This development mirrors what has been termed the shift from “learning to read” to “reading to learn” (e.g., Chafe & Tannen, 1987) – in elementary school, the majority of children become proficient enough that they can use reading as a means to an end (i.e., acquiring new knowledge), as opposed to an end unto itself.

The dual-route model assumes that the reader has a robust “mental dictionary” upon which to map meaning. Once a link is established between the orthographic form on the page and the individual’s underlying linguistic and conceptual knowledge, understanding ensues. There are children for whom understanding does not always take place. Children who can read words out loud may have impaired reading comprehension, either as an isolated disorder (Nation, Clarke, Marshall, & Durand, 2004), or as a symptom of autism (Nation, 1999) or language impairment (Bishop & Snowling, 2004). While not indicative of a disorder, a disconnect between decoding and comprehension is also common in SEB children’s reading, as discussed above. The dual-route model is still pertinent, however. Particularly relevant is how the lexicosemantic route applies to reading in childhood.
The Lexicosemantic Component of Childhood Reading

One way to evaluate the lexicosemantic component of reading is through the use of what are called semantic interference tasks, where there is a mismatch between a written word and some other visual stimulus. The most common of these is the Stroop task, where the word “red” may be written in blue ink, and the participant is instructed to ignore the word and name the color of the ink. Because the study in Chapter 3 contains a semantic interference component, the extant literature bears mentioning, especially as it notes changes in performance related to reading experience. This literature speaks to the effects of semantic competition, albeit within-rather than across-languages.

In one cross-sectional study, participants were asked to name black and white line-drawings accompanied by labels (Posnansky & Rayner, 1977). Two of the experimental conditions were the match condition, where the label was the name of the picture; and the Stroop condition, where the label was a noun matched for length and frequency of occurrence with the name of the picture (e.g., “house” with a picture of an apple). Reaction times were measured from onset of picture presentation to the onset of the spoken response (see Table 1-1).

In these experiments, the older children were faster overall than the younger children. At the same time, the Stroop effect was smallest in the first grade children, and largest in the older groups (with the exception of the sixth graders in experiment 1; note that different cohorts participated in each study). As lexical processing and
reading skill consolidate in development, then, interference effects may become more robust.

Table 1-1. Mean reaction times from three experiments in Posnansky & Rayner, 1977. Means were not reported for Experiment 2. Exp = Experiment. N = number of children per grade in each experiment. Match = time (in ms) to verbally identify a picture labeled with its name. Stroop = difference (in ms) between Match condition and Stroop condition, where the label did not match the picture (i.e., the Stroop effect). Less experienced readers are slower overall but have smaller Stroop effects.

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<td>434.6</td>
<td>661.5</td>
<td>359.3</td>
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A different cross-sectional study used the more conventional color Stroop task to evaluate change in semantic interference effects from childhood to adulthood (Comalli Jr., Wapner, & Werner, 1962). Participants aged 7-80 were asked to either read a color word or name the color of ink used on a card. In one set of cards, color words were written in black ink. In another, there were patches of various colors but no words. In the third, ink of one color was used to write the name of another color. Overall, the magnitude of the Stroop effect (the difference in naming times between the first and third sets of cards) was highest in the youngest group and decreased steadily with age. This finding conflicts with Posnansky and Rayner’s results above. However, the youngest participants in the color Stroop study were older than the youngest participants in drawing-label study. This difference was by design: the authors report that that “…after preliminary testing of 5 and 6 year olds it was found
that their reading ability was not sufficiently established as an automatized activity to serve as a potent factor of interference” (Comalli Jr. et al., 1962, p. 48). In other words, the Stroop effect was found to be too weak in younger children due to their inexperience with reading. This result is congruent with Posnansky and Rayner’s findings, where the Stroop effect was small in first grade and highest in third grade.

As the reading process becomes more automatic, it also becomes more vulnerable to interference from same-language distracters. Lexical processing in bilinguals is further complicated by the presence of a second lexical system, which can also interfere with the reading process. In the next section, how the two lexical systems interact in adult bilinguals is examined.

**Lexical Processing in Bilingual Adults**

The interaction of bilinguals’ two lexical systems has been studied extensively in adults. Research strongly suggests that lexical access in bilinguals is non-selective: lexical information in both languages is active regardless of the linguistic context. As Schwartz, Kroll, and Diaz (2007) put it, “…even when bilinguals are exposed to only one language, they cannot avoid activating lexical information of both of their languages” (p. 107). The notion of an integrated lexicon is at the heart of models of bilingual word activation such as the Bilingual Interactive Activation + (BIA+) model (Dijkstra & van Heuven, 2002). The development of this interactivity in bilinguals is one of the primary questions explored in this dissertation, so the relevant studies will be discussed in some detail.
Cognates and false cognates are of particular interest when studying cross-linguistic lexical activation, as both types of words share form cross-linguistically. In the case of cognates, they also share meaning (Schwartz et al., 2007). For example, the word “train” is a cognate with the Spanish word tren (for the purposes of distinguishing, non-English words will be italicized). False cognates do not overlap in meaning, causing them to sometimes be mistaken for true cognates. For example, many native English speakers incorrectly assume the Spanish word mano is a cognate for “man,” when it actually means “hand.” Cognates generally facilitate responses in adults (Costa, Caramazza, & Sebastian-Galles, 2000; de Groot & Keijzer, 2000; de Groot & Nas, 1991; Dijkstra et al., 1999; Schwartz & Kroll, 2006; Schwartz et al., under review; van Hell & Dijkstra, 2002), and false cognates generally inhibit responses (Dijkstra et al., 1999; Jared & Szucs, 2002). However, these effects can be mitigated by a number of factors in the study design, as will be seen below.

Three experiments examined how linguistic proficiency mediates cognate effects in the native language of Dutch-English-French trilinguals (van Hell & Dijkstra, 2002). Stimuli were Dutch words that were either non-cognates, cognates in English but not French (bakker: baker/boulanger), or cognates in French but not English (muur: wall/mur). The words were matched for length, log word frequency, and number of orthographic neighbors in Dutch. Participants were tested entirely in Dutch. In the first two experiments, the participants were more proficient in English than French, and were quickest to respond to the English cognates. In the third experiment, students with comparable proficiency in English and French were
recruited. These participants were significantly quicker to respond to both English and French cognates than the non-cognates. Thus, cognate facilitation was mediated by linguistic proficiency: more skilled French speakers responded more quickly to French cognates as well as English cognates, whereas the less skilled French speakers responded more quickly to English cognates only.

Evidence for cognate facilitation and false cognate interference was found in a pair of experiments asking participants to name a word written in red that was embedded in a sentence (Schwartz & Kroll, 2006). Sentence contexts were either neutral (“When we entered the dining hall, we saw the piano…”) or biased (“Before playing, the composer first wiped the keys of the piano…”). Target stimuli were cognates, false cognates, or length- and frequency-matched control words. Comprehension questions were included to ensure the participants were reading the sentences. In the first experiment, highly-proficient SEB college students from the U.S. participated. They were significantly faster to name cognates relative to the control words in the neutral, but not the constrained, context. There was no difference in naming times for the false cognates. The same task was administered to intermediate-proficiency bilinguals from Spain in the second experiment. The Spanish cohort was quicker to name cognate targets, as before. In addition, they made significantly more errors in naming the false cognates relative to controls in both the neutral and constrained contexts. Cognates facilitated responses for both groups, but false cognates interfered with responses for the less proficient, Spanish-dominant group.
Cognates do not always speed processing. In a word naming task, 18 Spanish-English bilingual adults dominant in English were shown 240 Spanish words or their English translations one at a time and asked to read them out loud (Schwartz et al., 2007). Half the words were cognates and half were control words matched for length and frequency. The cognates were categorized as high or low in both orthographic and phonological similarity across languages. “Piano” and piano were categorized as high-orthographic and high-phonological similarity cognates. “Base” and base (/base/) were high-orthographic but low-phonological similarity. “Train” and tren were low-orthographic but high-phonological similarity, and “mark” and marca were low in both categories. Cognates with a high degree of orthographic and phonological similarity across languages were named faster than other cognate types. Participants made significantly more errors in naming the Spanish high-orthographic but low-phonological similarity cognates. Most surprisingly, the bilinguals were significantly slower to name cognates than non-cognates in English (but not in Spanish). The primary differences between this study and the previous one were the lack of linguistic context (a sentence frame) and that both languages were tested at the same time. These changes in design may explain why the typical cognate facilitation effect was inverted.

Within-language lexical status of words can also mediate the impact of cognates in lexical processing. In a series of experiments by Schwartz et al. (under review) examining how homonyms affect cross-linguistic activation, participants were shown sentences that ended in a prime word, and then a target word in capital letters, and asked to respond whether the final word of the sentence was related to the target
word. There were 80 prime words, half of which were homonyms. The other 40 words were non-homonyms matched for frequency and length. Half of the homonyms were cognates (e.g., “novel”-novela) and half were non-cognates (e.g., “fast”-rápido). Only the dominant meaning of the cognate homonyms was shared with Spanish. The sentences were biased towards the subordinate meaning for homonym primes. Half of the target words were matched to the primary meaning of each prime word, such as BOOK for “novel” or SPEED for “fast;” the rest were unrelated fillers. Participants were 147 SEB undergraduate students who were shown the sentence with the prime and then the target word in all capitals and asked to decide whether the target was related in meaning to the previous sentence. Participants made more errors on homonym trials and the most errors on the cognate homonym trials. Thus, they were more likely to incorrectly say a target word was related to the previous sentence if it was related to the dominant meaning of the homonym, and even more likely to make this error if that meaning was co-activated in Spanish. Participants were slower to respond to homonyms and faster to respond to cognates overall, but there was a trend towards an interaction between homonym and cognate status, indicating they were slower to respond when prime words were cognate homonyms.

The same article reports on a follow-up experiment that was conducted with a few key changes. New primes were selected where cognate homonyms shared a subordinate meaning across languages (e.g., “arm”-arma). Sentences were created that biased towards the dominant meaning of words. The target words were related to the subordinate meaning, such as KING for “ruler.” Participants were 125 SEB
undergraduate students who were asked if the target word was related to any meaning of the prime word. More errors were made on homonym trials than non-homonym trials, and on non-cognate homonym trials than cognate homonym trials. In other words, participants were more accurate when the subordinate meaning was activated cross-linguistically. Participants were slower to respond to homonyms and also slower to respond to non-homonym cognates. Both experiments were repeated with ME undergraduate students; no cognate effects were found in the monolingual groups.

A study of repetition priming in 24 English-Italian bilinguals suggested that such priming is mediated by activation of meaning, either within or across languages (Lalor & Kirsner, 2001). The bilinguals were native English speakers who gave themselves proficiency scores of 5 or higher (max. 7) in both languages and used both languages on a daily basis. In the preliminary phase of a lexical decision task, target words were shown with a semantically related word. Targets were either cognates (“depression”/depressione, paired with “sadness”), false cognates (“estate”/estate, translation: “summer”, paired with “manor”), and fillers (“pea”/pisello, paired with “vegetable”). Words in the second (test) phase were either novel (i.e., they had not been presented in the preliminary phase), same-language repetitions, or cross-language repetitions. In the cross-language repetition condition, participants either had seen a word with highly similar meaning and form (cognate), highly similar form but not meaning (the false cognate), or highly similar meaning but not form (filler). During the test phase, non-words were interspersed with the target words. Participants were significantly faster to judge cognates as words in the test phase if they had seen them
previously in the study phase, regardless of whether it was in the same-language or cross-language condition. For the false cognates and the fillers, repetition effects were only seen in the same language condition. The authors conclude that repetition effects are only seen if both form and meaning are activated.

Eye-tracking research on the reading of cognates has revealed how proficiency mediates the impact of bilingualism on lexical processing. German-English bilinguals and English monolinguals heard English words while looking at four pictures (Blumenfeld & Marian, 2007). Half of the targets were cognates and the rest were non-cognates. In addition, half of the trials included a distracter whose German translation had a phonological overlap with the target’s English name (e.g., for target “desk,” a picture of a lid – Deckel – was used as a distracter). In the control condition, none of the distracters’ German translations were similar to the target word. This provided four conditions: +cognate +distracter, +cognate -distracter, -cognate +distracter, and -cognate -distracter. Monolinguals looked equally at the German competitor and the control items in both the +cognate and -cognate conditions. The German bilinguals looked significantly more to the German competitor in both conditions. However, the English bilinguals only had significantly more looks to the German competitor in the +cognate condition. Thus, activation of German was boosted by the cognates in the participants with lower German proficiency (causing them to look more at the German distracters).

The research in adult bilinguals provides strong evidence for the interaction of both the first and second language, even when only one is being used. Generally,
cognates facilitate responses and false cognates interfere with them. However, these effects are mediated by linguistic proficiency: French cognates were only found to speed responses to Dutch words in Dutch-English-French trilinguals who were highly proficient in French (van Hell & Dijkstra, 2002). Spanish-dominant bilinguals made more errors in naming false cognates in English than English-dominant bilinguals (Schwartz & Kroll, 2006). English-dominant bilinguals tested in English looked significantly more at German distracters only after hearing a German-English cognate, whereas German-dominant bilinguals looked more at the German distracters even after hearing a non-cognate (Blumenfeld & Marian, 2007). The experimental paradigm is also important. Cognates speeded responses in a word-naming task where a sentential context was provided (Schwartz & Kroll, 2006), but slowed responses in a word-naming task where words were presented in isolation and where language was varied (Schwartz et al., 2007). This slowing was likely due to competition between the two phonological systems, as evidenced by quicker naming of words with high phonological and orthographic overlap and increased error rate in naming words with high orthographic but low phonological overlap.

The discussion of the dual-route model above raised the problem of applying adult models of reading directly to reading in children. Taking bilingual models based on adults and extrapolating them to children will be necessary to an extent, given the limited research on bilingual lexical processing in children. The extant research will be reviewed in the next section.
**Lexical Processing in Bilingual Children**

Research examining lexical activation in bilingual children is scant. Cognates have been proposed as a productive area for bridging gaps in SEB children’s vocabularies in instruction (August et al., 2005; Restrepo & Gray, 2007). There is good reason to expect that teaching cognates would be particularly beneficial to SEB students. Spanish-English cognates typically share a Latinate root, and tend to be lower frequency terms in English (Kamil & Hiebert, 2005). Researchers have estimated that approximately 30-50% of the terms used in academic and scientific language are cognates with Spanish (Bravo, Hiebert, & Pearson, 2007; Nash, 1997). However, this does not tell us much about how the bilingual lexicon develops in children.

Little is known about online processing in bilingual children. There appears to be only one study that has examined online responses to cognates and false cognates in school-age children. A lexical decision paradigm was administered to 5th, 7th and 9th grade Dutch students learning English with 5 months, 3 years, and 5 years average English exposure, respectively (Brenders, van Hell, & Dijkstra, 2011). In the first (English) task, children were more accurate and quicker in identifying cognates as words than non-cognate controls, and older children were more accurate and quicker than younger children. In the second (Dutch) task, there were no significant effects of performance for cognates relative to non-cognates, although the older children were still quicker and more accurate. In other words, the dominant language (Dutch) bootstrapped performance in the non-dominant one (English), but not vice versa.
The third task was most pertinent to the current study. A new group of 5th, 7th, and 9th graders completed a lexical decision task including cognates and false cognates, with the youngest group repeating the task twice, 4 and 14 months later. Children responded significantly more slowly and made more errors on cognate and false cognate trials relative to control words. In the cross-sectional data, an attenuated version of this profile was seen in the older children. Longitudinally, the children improved with time (responding more quickly and more accurately overall), but the magnitude of the interference effect for cognates and false cognates remained consistent across testing sessions. Brenders et al. concluded that cognate facilitation is more likely to be seen in the non-dominant (rather than the dominant) language – in this case, English, but not Dutch. However, cognate facilitation was not seen when false cognates were also present. Brenders and colleagues suggest that the children were only able to trust the cognate status of words when they appeared with neutral words. When false cognates were included, children overgeneralized their mistrust of false cognates to the cognates as well. Note that children were not asked to assign meanings to these words, just to decide whether they were words or not. Nonetheless, some level of semantic information must have been activated during the task for the inclusion of false cognates to invert the cognate facilitation effect.

One other study is pertinent for present purposes, although it does not address online lexical processing directly. The study employed offline assessments of cognate use during reading in 74 SEB students between 4th and 6th grades (Nagy, Garcia, Durgunoglu, & Hancin-Bhatt, 1990). Participants were identified by the school as
bilinguals based on school records, assessments, and personal knowledge; the authors
do not mention whether comparable data was available for the student’s proficiencies
in the two languages (e.g., whether the school conducted Spanish assessments). The
task battery included reading four expository texts, Spanish and English vocabulary
self-assessments, a multiple-choice English vocabulary test, and a cognate
identification task. The vocabulary tasks assessed the students’ knowledge of cognates
in the texts. The cognate identification task explained what a cognate was and asked
students to circle cognates in the texts they read.

There were 193 cognates, 12 false cognates, and 450 non-cognates across all
passages (repeated words were counted only once). Students circled an average of 42
cognates, 1 false cognate, and 20 non-cognates in the cognate identification task. Key
content words in the passages were identified and categorized as cognates or non-
cognates. Students reported knowing approximately 60% of these key words in
Spanish and English in the vocabulary self-assessment.

The multiple choice English vocabulary task assessed students’ knowledge of
these key words. A regression analysis indicated that students in the initial cohort who
reported having a larger English vocabulary did better on the multiple-choice task, as
well as those students who correctly identified more of the key words as cognates.
There was also a significant interaction between Spanish vocabulary and cognate
identification: there was a strong correlation between Spanish vocabulary and
performance on the multiple-choice task for students who recognized many cognates,
and a negative correlation between Spanish vocabulary and the multiple-choice task
for those who recognized few. That is, a larger Spanish vocabulary actually appeared
to negatively impact English vocabulary for students with little awareness of cognates – perhaps because a larger Spanish vocabulary suggests a smaller English one. However, positive transfer of Spanish vocabulary occurred for students able to consciously identify given lexical items as cognates. It is unclear how this conscious awareness would affect cross-linguistic activation in an online paradigm.

There is evidence of cognate facilitation in older bilingual children. Contrary to what has been seen in adults (e.g., Schwartz & Kroll, 2006), when false cognates were included, both cognates and false cognates slowed response times relative to control items (Brenders et al., 2011). It is unclear whether this profile will be present in younger children. In addition, the slowed responses were in a lexical decision task, where the lexical status of a letter string is more important than its meaning. A task that assesses word meanings more directly may show cognate facilitation even in the presence of false cognates.

**Questions of Interest – Study 2**

Bilingual children have two lexical systems that interact with each other. In the case of SEB children, they also have an established profile of comparable decoding but less robust vocabularies relative to their ME peers. This study seeks to answer the following questions:

- What impact do intra- and inter-linguistic factors have on SEB children’s ability to assign meaning to text?
• How does the absence of a robust English vocabulary and presence of a Spanish lexicon affect processing of English lexical items?

In order to answer these questions, an online written vocabulary task was designed. Children saw a picture and four words and were asked to select the word that matched the picture. There were three experimental conditions. In the cognate condition, the target shared form and meaning across languages. In the false cognate condition, one of the English distracters was form-similar to the Spanish translation of the target. In the phonological condition, the three distracters were all highly similar in form to the English target. The study is described in Chapter 3.

The Need for Research on Writing in Bilingual Children

Reading is not the end-all and be-all of literacy. Literacy also includes writing, which is an increasingly important skill for academic and professional success as well as for communication in the digital age (Clendon, Sturm, & Cali, 2012). Despite being a vulnerable domain for SEB children, writing in the SEB group has not received the attention it deserves (August & Shanahan, 2006; Danzak, 2011; Soltero-González, Escamilla, & Hopewell, 2011). The research that has been conducted has often been flawed: of 56 studies of bilingual writing surveyed in a recent review, very few were found to have sufficient methodological rigor (Fitzgerald, 2006).

Quality research on the writing of SEB children is thus sorely needed (Harklau, 2002). From a theoretical perspective, it is important to examine how the written forms of a language are acquired by a typically-developing child with less robust
spoken language abilities in that language. From a clinical perspective, profiling
typical SEB children’s writing increases our ability to identify writing disorders in this
population. Similar research has been conducted on the spoken language of bilinguals
(Paradis, 2005), but not their written language.

Research on reading development in bilingual children has provided a deeper
understanding of literacy acquisition, especially regarding the importance of non-
phonological linguistic skills (see above). Research on bilingual children has the
potential to provide further insights into writing development. Additionally, examining
the expressive channel of written language can inform our knowledge of challenges in
the receptive channel (i.e., reading) that might not otherwise be discovered (such as
familiarity with conventions of written language). Reading and writing are closely
related and interact with each other, both in monolingual (Ehri, 2000) and bilingual
(Hudelson, 1984) children. Finally, evaluating the writing of the SEB group may also
speak to their reading challenges: the National Assessment of Education Progress
(NAEP) reading test given to all fourth, eighth, and twelfth grade students contains a
significant writing component. Results of this test are often cited when discussing the
reading challenges of SEB children, despite the fact that it conflates reading ability
with writing ability.

Study 3 provides a high-quality analysis of monolingual and bilingual
children’s written narratives from first through fourth grades. The narratives were
analyzed using multiple measures under three broad dimensions: productivity,
complexity, and accuracy. As background to Study 3, the research on writing in monolingual and bilingual children is reviewed below.

**Development of Writing Ability in Monolingual Children**

Written development in ME children is relatively well-studied (e.g., Bartlett, 1984; Green et al., 2003; Hunt, 1965; Kroll, 1981; Perera, 1984; Purcell-Gates, 1988; Stubbs, 1980; Tannen, 1982). From age 3, children begin to discriminate between drawing and writing, and demonstrate sensitivity to characteristics of writing like linear arrangement on the page (Treiman & Bourassa, 2000). Acquiring the alphabetic principle is important for writing, just as it is for reading: children learn that spelling is meant to encode the phonology of a word (Ehri, 2000; Treiman & Bourassa, 2000). At around age 5, children begin to be able to distinguish letters from letter-like symbols (Lavine, 1977). During elementary school, children shift from treating written language as transcribed speech to reserving specialized structures (e.g., the impersonal pronoun “one”) for their writing (Kroll, 1981).

Kroll (1981) posited that, since ME children enter school with relatively strong spoken skills but “minimal” writing skills, writing instruction should proceed in phases. First, children should be taught transcription skills like handwriting and spelling. In the “consolidation” phase, children are encouraged to draw on their oral language abilities to strengthen their writing. Then, children should be taught to differentiate their writing from their speech.

The transcription phase in Kroll’s schema parallels one of the four domains outlined by Berninger and colleagues (Berninger, 1994; Berninger & Swanson, 1994).
In addition to transcription, Berninger and colleagues identified planning, text generation (word choice/sentence structure), and revision as aspects of writing children must master. Their model was based on the model of writing in adults by Hayes and Flowers (1980).

**The Link Between Spoken Narratives and Literacy**

The connection between spoken narratives and literacy has been examined in a number of studies. Two types of narrative ability are thought to be particularly linked to literacy skills: use of story grammar and of literate language features. Story grammar is the macrostructure of the story, the episodic form of setting, problem and resolution (Mandler & Johnson, 1977; Merritt & Liles, 1987). Literate language features are specific linguistic markers uncommon in conversational speech but common in written English, such as adverbial clauses and elaborated noun phrases (Greenhalgh & Strong, 2001; Justice et al., 2006; Kaderavek & Sulzby, 2000; Wallach & Butler, 1994).

Literate language features are an index of linguistic proficiency, and thus less likely to be present in the narratives of children with limited English ability (e.g., Kaderavek & Sulzby, 2000). Story grammar, on the other hand, is an index of narrative proficiency.

Analysis of written language may also provide insights into the reading abilities of SEB children. Spoken narratives and literate language features are often studied because they are thought to predict reading ability. Examination of written narratives seems more suited in this regard because it shares a modality with reading.
Spelling and decoding are strongly correlated (Abbott, Berninger, & Fayol, 2010; Ehri, 2000), so poor spelling may be indicative of poor decoding. Strong narrative structure suggests familiarity with stories and exposure to books. One reason written narratives are less studied in SEB children relative to other populations, despite the need for more research on the role of writing in second language acquisition (Harklau, 2002), may be the expectation that it will just reveal further areas of vulnerability. As discussed above, oral comprehension and vocabulary are vulnerable in SEB children, but decoding is a relative strength. Since decoding and spelling correlate, one expects that spelling will be comparable between SEB and ME children. The latter group is likely to outperform the former on indices of lexical ability, given the differences seen in vocabulary between the two groups. Appropriate use of spoken verb morphology has also been found to be vulnerable in English learners (Paradis, 2005). However, the English learners enrolled had limited (2-18 months) exposure to English and a variety of home languages, so the error rates are likely higher than what is typical for SEB children.

Narratives can also be analyzed for cohesion (Chafe, 1976). Correct use of cohesive devices such as character introduction and maintenance have been found to distinguish between poor writers and good writers (Bartlett, 1984) as well as being used cross-linguistically (Jisa, 2000; Serratrice, 2007). Cohesion measures may be more sensitive than microlinguistic measures, especially for young children (e.g., Wigglesworth, 1990).
The goal in exploring these vulnerable domains is not to belabor the differences in performance between the monolingual and bilingual groups, but rather to further explore the profile of SEB children in the written domain.

**Development of Writing Ability in Bilingual Children**

Research on writing in English learners generally and SEB children in particular has been limited. Many of these studies are observational, presented as case studies (e.g., Serrano & Howard, 2007), or lack large sample sizes and a comparison group (e.g., Edelsky, 1982).

One study of four southeast Asian bilinguals (Urzua, 1987) found linguistic confidence and regular practice to be helpful for their writing. Hernandez (2001) studied writing in 1 ME and 3 SEB fifth grade students. Two students each were identified as either strong or weak writers by their teachers. The children’s writing was analyzed for ideas, complex sentence use, and spelling. While formal statistical analysis was not possible with such a small group, the author nonetheless concluded that the writing skills of the weak writers were not significantly behind those of the strong writers, and that the strong SEB writer was “virtually indistinguishable” from the strong ME writer (Hernandez, 2001, p. 251).

A similar paradigm was used by Lanauze and Snow (1989). They split 38 4th and 5th grade SEB children enrolled in a bilingual elementary school into 3 groups based on teacher evaluations of oral fluency, aural comprehension, and reading ability in English and Spanish. During class, children were asked to write a description of a picture. Overall, the poor English/good Spanish group performed as well as the good
English/good Spanish group in both English and Spanish, with the poor English/poor Spanish group scoring significantly lower in both languages. Lanauze and Snow conclude that the Spanish abilities of the poor English/good Spanish group are transferring to their English writing. Similar results were found more recently in 20 junior high school SEB students (Danzak, 2011).

Literacy interventions were provided to two cohorts of low-SES Hispanic first graders attending a bilingual school (Carlisle & Beeman, 2000). Most of the students had Spanish as the primary language in the home (60%). The first cohort was taught in English in kindergarten and received 80% of their first grade instruction in English, including all of their literacy instruction. The second received 80% of their kindergarten and first grade instruction, including their literacy instruction, in Spanish. In addition to standardized reading tests, the children were provided with a prompt (e.g., “If I had a million dollars...”) for a written narrative in English and Spanish at the end of the school year. Narratives were evaluated for length (number of words), clausal density (words per t-unit), spelling (percentage of words spelled correctly), and a story grammar rating (from 0 to 7, ranging from no decipherable text to a fully-realized narrative). Children in the second (Spanish-instructed) cohort performed comparably to the first (English-instructed) cohort on all the English narrative measures and outperformed them on all the Spanish narrative measures. Surprisingly, the Spanish cohort had significantly greater clausal density in English than the English cohort. Carlisle and Beeman attribute this unexpected result to the transfer of skills from Spanish to English but concede they cannot rule out teacher effects. Cohort
effects are not mentioned but given the lack of a baseline writing measure could also explain this finding (aside from attending the same school during first grade, the children were not matched on any parameters).

One of the only studies of writing in SEB children that featured a monolingual comparison group was conducted by McClure and Platt (1988). They studied temporal markers in the written narratives of 80 upper class ME and SEB children divided equally between 4th and 9th grades at two private schools. The SEB children’s school was bilingual. Children wrote narratives based on one of two silent films. Temporal markers analyzed were use of verb tense markers, subordination, participles, temporal adverbs (e.g., finally), progressive markers, and lexical ties (a cohesive tie between two verb phrases based solely on continuity of meaning, such as “They went to school. The teacher taught them about numbers”). The ME children used more subordination, participles, and temporal adverbs than the SEB children, who used more unmarked verbs (“The mole get the tooth out”) and progressive markers. McClure and Platt highlighted lack of verb tense marking as the primary difference between the two groups’ narratives. In contrast, Carlisle (1989) found no significant differences in error rate in the writing of late elementary school ME and SEB children, but he included spelling, morphosyntactic, punctuation and capitalization errors in a single category, which may have masked specific differences.

Despite the importance of writing to literacy and academic development, there are few adequately powered studies of writing ability in SEB children. Given that SEB children are a growing population in U.S. schools and are at risk for poor academic
outcomes, and the importance of being able to write in academic in professional settings, there is a particular need for more information about initial writing development in this group.

**Analysis of Written Narratives**

The study in Chapter 4 is concerned with characterizing the writing of SEB children relative to ME children. To that end, this section reviews various dimensions researchers have used to analyze written discourse. Hunt (1965) focused on variables that distinguished what he termed “mature” writing from immature writing. Length, words per clause, and complex syntax use have all been shown to increase from first to twelfth grade in ME children (Hunt, 1965; Kroll, 1981; Loban, 1976). Correct use of cohesive devices such as character introduction and maintenance have been found to distinguish between poor writers and good writers (Bartlett, 1984) and young and old children (Bartlett and Scribner, 1982).

Children with language impairment have deficits in linguistic development with no apparent cause. A number of measures are sensitive to differences in the writing of children with typical development and children with language impairment. Because of the troubling history of treating bilingualism as a disorder in early psychological research (Dunn, 1988; Garretson, 1928; Garth, 1925, 1928; Harvey, 1949), it is important to emphasize that the research on children with language impairment is not being discussed to imply that SEB children also have a language impairment. Instead, the next paragraph reviews research on children with language impairment to provide evidence of the utility of certain written language variables.
Spelling and written morphology have been shown to be clinically sensitive measures in research on children with language impairment. Even children with age-appropriate spoken language have been shown to make significantly more morphological and spelling errors than children without language impairment (Bishop & Clarkson, 2003; Fey, Catts, Proctor-Williams, Tomblin, & Zhang, 2004; Mackie & Dockrell, 2004; Scott & Windsor, 2000; Silliman, Bahr, & Peters, 2006; Windsor, Scott, & Street, 2000). Spelling errors can be further analyzed for phonological plausibility, or whether the misspelling appropriately encodes the speech sounds of the target word (Silliman et al., 2006; Treiman & Kessler, 2004). Such analyses go beyond dichotomous correct/incorrect scores to evaluate children’s use of phonology to guide their spelling of words.

In addition to basic length counts (number of words), two other measures are used as indices of a writer’s lexical knowledge. Number of different words (NDW) is the total number of words minus any repeated words, yielding a count of each distinct word used (Fey et al., 2004; Kay-Raining Bird, Cleave, White, Pike, & Helmkay, 2008; Scott & Windsor, 2000; Wellman et al., 2011). A higher NDW is associated with more advanced writing (Beard, 1986). The problem with NDW is that it does not address length differences by controlling for total number of words. The type-token ratio (TTR) is the proportion of different words to total words (Yorkston, Jaffe, Polissar, Liao, & Fay, 1997), and is more frequently used because it controls for differences in length. However, TTR is still problematic because extremely short texts will have inflated TTRs due to lack of repetition of function words like articles and
Writing ability increases with age in ME children as they become more competent in transcription factors like spelling and handwriting as well as text generation factors like word choice and verb marking. Each of these dimensions provides a potential avenue for analysis in comparing writing between the ME and SEB groups.

**Summary of Narrative Measures**

As mentioned above, variability in early writing may mask differences between the ME and SEB children. The written narrative measures have been shown to be sensitive in previous research to increase the likelihood of finding differences between the two groups should they be there. The measures used in the written narrative study fall into three broad categories. Productivity measures were:

- length (number of words)
- number of different words (NDW)
- story grammar score (presence of structural elements such as setting, conflict and resolution)

Complexity measures were:

- clausal density (words per proposition)
- proportion of literate language features
- syntax score (based on presence of markers of temporality, such as “after,” and causality, such as “because,” in the narratives)
Accuracy measures were:

- proportion of spelling errors
- proportion of phonologically plausible spelling errors
- proportion of morphological errors (verb tense marking/agreement)
- proportion of lexical errors (incorrect word choice)
- proportion of pronoun errors (lack of agreement, ambiguous or referent-less references)

**Questions of Interest – Study 3**

Research on the early writing of SEB children is of practical importance for clinicians and educators alike. This research also has theoretical importance in examining the relationship between reading and writing in monolingual and bilingual children. However, there is very little quality research on these topics available. In study 3, answers to the following questions are sought:

- How do SEB children compare to ME children in terms of early written expression?
- How do demographic factors impact writing in the ME and SEB groups?

Written narratives from earlier studies of ME and SEB children were combined with written narratives from the children recruited for Studies 1 and 2. The productivity, complexity and accuracy measures were used to evaluate differences between the ME and SEB children. As with Study 1, children were then matched for SES and the analyses were repeated to examine how the profile changed when controlling for SES. The study is described in Chapter 4.
Chapter 2

The Effects of Demographic Variables on Language and Literacy in Spanish-English Bilinguals
Abstract

Purpose: The present study explores demographic and linguistic factors of reading in monolingual and bilingual children with an aim of helping school professionals evaluate the reading performance of students from diverse linguistic and socio-economic backgrounds.

Method: Demographic variables (parental education level, number of books in the home, and frequency of being read to) and linguistic variables (decoding, fluency, vocabulary, oral comprehension, and reading comprehension) were evaluated in 68 native English speakers and 66 Spanish and English speakers in first through fourth grades from the same schools.

Results: Despite being recruited from the same schools, the two linguistic groups differed significantly on all three demographic variables. The monolingual children scored higher on all the linguistic variables save for decoding. When the children were matched for socio-economic status, monolingual children only showed an advantage in vocabulary. In addition, bilingual children showed an advantage in decoding.

Conclusions: Linguistic status and demographic background may be confounded, even for students at the same school. Vocabulary is critically important for bilingual readers. Decoding is a strength of typical bilingual children, calling into question the need for phonological interventions in this group.

Keywords: Bilingual, Reading, Decoding, English Learners, Socio-economic Status, Spanish
Overview

Literacy is crucial for academic and professional success (Hernandez, 2011; Lloyd, 1978). Spanish-English bilingual children (hereafter “bilingual children”) are a growing proportion of students in U.S. schools (Shin & Kominski, 2010). However, a number of studies suggest these children struggle with reading (Lee et al., 2007; NELP, 2008; Restrepo & Gray, 2007) and lag behind their monolingual peers in many of the linguistic factors that contribute to literacy acquisition (Lesaux & Kieffer, 2010; Nakamoto et al., 2007; Oller & Eilers, 2002). The majority of the bilingual children in the U.S. come from low-SES homes and attend low-SES schools (August & Hakuta, 1997; Goldenberg et al., 2006; Ready et al., 2002; Ruiz de Velasco & Fix, 2000).

School professionals are increasingly tasked with evaluating typical performance in children from diverse backgrounds. One purpose of this study is to explore the profile of young bilingual readers, and how demographic factors relate to linguistic skills.

Bilingual children appear to start behind their monolingual peers in pre-reading skills (Brice & Brice, 2009; "Head Start FACES 2000," 2003), and graduate from high school reading, on average, at the eighth grade level (Donahue et al., 1999). The evidence that bilinguals start behind is questionable, however, as discussed below. A second motivation of this study is to examine whether bilingual children start behind, or fall behind, their monolingual peers.

In the present study, monolingual and bilingual children were recruited from the same school and compared on a number of demographic and linguistic variables. Disparities in SES between the two groups were revealed, so the monolingual and
bilingual children were matched for SES and the analysis of linguistic variables was repeated. The data speak to the practical needs of the bilingual children in an educational setting as well as the theoretical importance of demographic factors to outcomes for bilinguals. In the following sections, demographic and linguistic factors important for reading in monolingual and bilingual populations are discussed. In addition, the case will be made for the importance of non-phonological skills in early reading for bilingual children.

Early Development of English Reading in Monolingual Children

*Phonological awareness* is knowledge of the sound structure of spoken words, and has been identified as one of many crucial skills for early reading development (Rayner et al., 2001; Snow et al., 1998). For beginning readers, this skill is thought to be one of the strongest predictors of reading ability (e.g., Brady & Shankweiler, 1991; Perfetti, 1985; Rieben & Perfetti, 1991; Shankweiler & Liberman, 1989). Its primary relationship to reading seems to be in how strongly it predicts *decoding* (Bradley & Bryant, 1983; Shankweiler et al., 1995; Stanovich, 1986). Decoding is the ability to apply sound-spelling rules to a written word to produce a phonological representation of that word (whether reading out loud or silently). Without decoding, reading comprehension cannot happen (e.g., Gough & Tunmer, 1986).

Meta-analyses examining components of literacy have identified contributions of phonological skills such as decoding and phonological awareness as well as non-phonological skills such as vocabulary and oral comprehension (NELP, 2008; NICHD, 2000; Snow et al., 1998). In young children, phonological skills showed the
strongest effect sizes for reading ability. A meta-analysis of reading in children from diverse linguistic backgrounds reinforced these findings (August & Shanahan, 2006).

While phonological skills develop rapidly, their continued benefit to reading diminishes over time relative to non-phonological skills that provide modest but continuous contributions to reading ability (Barnett & Frede, 2009; Dickinson et al., 2010; Gutierrez, Zepeda, & Castro, 2010). In the “Simple View” of Reading, decoding and oral comprehension are both important predictors of reading comprehension (Gough & Tunmer, 1986). In this framework, decoding is a means to the end of reading comprehension, but comprehension is not a foregone conclusion once decoding has taken place (e.g., Nation, Clarke, Wright, & Williams, 2006).

**The Reading Profile of Bilingual Children**

Bilingual children are often assumed to start behind their monolingual peers in reading ability because the former group has less robust phonological awareness abilities (Brice & Brice, 2009; Cisero & Royer, 1995; "Head Start FACES 2000," 2003; Rolla San Francisco et al., 2006). However, bilingual children typically perform comparably to monolingual children on measures of non-word decoding (e.g., Bialystok et al., 2003). Few studies have systematically explored the reading ability of early bilingual readers to identify how they fare relative to their peers.

What is most striking about the skilled decoding of bilingual children is that it often is the only measure where they perform comparably to their monolingual peers. A comprehensive examination of Spanish-speaking children used a battery of standardized tests to evaluate 814 bilingual and 248 monolingual children in
kindergarten, second, and fifth grade (Oller & Eilers, 2002; Oller et al., 2007). The bilingual children scored significantly below the monolingual children on English measures of vocabulary, reading comprehension, and word decoding; but not on non-word decoding. Note that the vocabulary measure used only assessed the bilingual children’s English vocabulary, not the total number of concepts they had names for in both their languages (Pearson, Fernandez, & Oller, 1993; Umbel, Pearson, Fernández, & Oller, 1992).

In addition, the bilingual children in the study performed comparably to monolingual children on reading comprehension in kindergarten. Differences were found for the second and fifth grade children, seeming to support the notion that the two linguistic groups start off comparably, and that bilingual children *fall behind*, rather than *start behind*, their monolingual peers. However, the authors themselves question the validity of the reading comprehension measure for kindergarteners. In the second grade cohort, there were significant differences in reading comprehension between the two linguistic groups. Thus, it is unclear whether, as bilingual children begin to learn to read, they have comparable performance initially and gradually lose ground, or whether they start off at a disadvantage.

**The Development of Reading**

Identifying reading problems as quickly as possible is challenging, but important, as gaps between good and poor readers widen over time (Alexander et al., 2007; Juel, 1988; Stanovich, 1986). Third grade reading ability is a strong predictor of later academic achievement, with poor readers being three times less likely to graduate
than good readers (Hernandez, 2011; Lloyd, 1978). Students who drop out of high school have cited frustration with reading as the primary reason for leaving school (Penty, 1956).

How the reading profile of bilingual children changes from grade-to-grade is a crucial question. The complexity of vocabulary and linguistic structures increases steadily throughout elementary school. Reading in early grades relies heavily on phonological skills like decoding, while oral comprehension becomes a stronger predictor of reading in late elementary school (Hoover & Gough, 1990; Proctor et al., 2006; Vellutino et al., 2007).

Previous research indicates it is non-phonological, rather than phonological, skills that make reading challenging for bilingual children (August et al., 2005; Lesaux & Kieffer, 2010; Lesaux et al., 2007; Mancilla-Martinez & Lesaux, 2010). However, it is unclear whether the differences between this group and their monolingual classmates change over time. Interactions of grade and linguistic group (monolingual vs. bilingual) are thus of particular interest: lack of a grade by linguistic group interaction indicates stable differences, whereas significant interactions suggest differences that change over time.

The Impact of Demographic Factors on Reading

Research on bilingual children must address a seeming paradox. The studies reviewed above that show bilingual children perform below their monolingual peers in vocabulary, oral comprehension, reading comprehension and phonological awareness need to be reconciled with studies showing a “bilingual advantage” in word learning
(Kaushanskaya & Marian, 2009), grammaticality judgments (Galambos & Goldin-Meadow, 1990), and phonological awareness (Bialystok et al., 2003; Kang, 2012; Kuo & Anderson, 2010). One possible explanation is that SES interacts with bilingualism such that only bilinguals coming from privileged backgrounds (e.g., higher-educated parents and better in-home language support) gain the cognitive and linguistic benefits seen in the literature (Cummins, 1979). Bilingual children are more likely to come from low-SES homes and attend low-SES schools than their monolingual peers (August & Hakuta, 1997; Goldenberg et al., 2006; Ready et al., 2002).

There are multiple ways in which home environment can affect literacy development. Early book exposure and reading experiences are tied to reading achievement (Feitelson & Goldstein, 1986; Heath, 1982; Park, 2008; Sénéchal & LeFevre, 2002). Parental education and linguistic proficiency are strongly tied (Entwisle & Astone, 1994; Hakuta et al., 2000), as highly-educated parents use language structures more likely to be found in the classroom (Dickinson & Tabors, 2001). Number of books in the home is a strong predictor of reading outcomes (Evans et al., 2010; Park, 2008). The size of the home library is thought to index parental attitudes towards reading rather than being a causal factor in increasing reading and educational achievement.

The effects of home environment on a child’s educational outcomes are typically significant, but modest (Aschaffenburg & Maas, 1997; Scarborough & Dobrich, 1994). Meta-analyses on the impact of SES on children indicate that school SES is a much better predictor of reading outcomes than home SES (Sirin, 2005;
White, 1982). In other words, living in a low-SES home and attending a high-SES school should lead to better reading outcomes than living in a high-SES home and attending a low-SES school. School variables account for a significant amount of variance in English language proficiency in bilingual children, even after home and other social variables are accounted for (Carhill et al., 2008).

Both home and school factors influence reading achievement, although school factors appear to be more important. Many studies control only for home SES (Alexander et al., 2007; Oller & Eilers, 2002), leaving potential disparities in school SES unaddressed. The present study sought to explore the impact of demographic factors on reading in the bilingual children by 1) evaluating whether differences in home SES are still present when recruiting children from the same schools, and 2) how controlling for differences in school and home SES affects the linguistic differences between the bilingual and monolingual groups.

**Questions Explored By the Current Study**

The present study seeks to evaluate the profile of young monolingual and bilingual readers, and explore the relationship of demographic factors to linguistic factors that underpin literacy. Previously, the relationship of decoding to early reading was discussed. In addition, studies showing bilingual children’s decoding is comparable to monolingual children’s were reviewed. This foundation is the basis for the first hypothesis below. The second hypothesis is derived from research showing that bilingual children are more likely to come from low-SES backgrounds than
monolingual children, and that SES is a strong predictor of reading outcomes, as discussed in the previous section.

The specific hypotheses for the study were:

- **Initial Equality Hypothesis**: because bilingual children have comparable decoding ability to monolingual children and because decoding is so important to early reading, bilingual children and monolingual children will start off comparably in reading comprehension in the younger age groups. In the older age groups, there will be significant differences, suggesting the bilingual group falls behind over time.

- **Socio-Economic Hypothesis**: bilingual children will score significantly lower on measures of socio-economic status than monolingual children, even within the same schools. Controlling for differences in socio-economic status will mitigate some, but not all, of the differences between the two groups on component skills of literacy.

**Participants**

As part of a larger study approved by the Institutional Review Boards of San Diego State University and the University of California, San Diego, children were recruited from two low-SES schools (> 50% students who qualify for a free or reduced-price lunch) in California. Both the schools provided English-only education for their students. All students between first and fourth grade at one school were invited to take part in the study, as well as students from four classrooms at the second school. None of the classrooms were limited to monolingual or bilingual students; thus, teachers were the same for both groups of children. Consent forms and a home information questionnaire, adapted from Marian, Blumenfeld, and Kaushanskaya
(2007), were sent home with the students. The questionnaire asked about the child’s educational history, language exposure, and home literacy environment.

Consent forms were returned by 196 students. Criteria for exclusion were: a home language other than English or Spanish ($n = 18$) or a history of speech-language disorders or reading problems ($n = 17$). Out of the remaining 161 students, 68 monolingual and 66 bilingual children were matched for age and tested. The remaining 27 students were not tested due to time constraints.

The monolingual children were identified initially through school records. In addition, the parents indicated their children had no Spanish ability, which was confirmed by interviewing the children. Bilingual children had a home language of Spanish per school records and parent report. They also reported some degree of reading and writing ability in Spanish.

Children were pseudo-randomly selected to provide roughly balanced numbers of students from each linguistic background at each grade. All children completed all the English measures. Bilingual children who could not complete the Spanish testing battery ($n = 13$) were excluded from analysis.

**Demographic Measures**

Three demographic measures were analyzed from the questionnaires: approximate number of books in the home, frequency of reading to child, and parental education level. These measures were selected because previous research has indicated they are strong predictors of linguistic proficiency and reading in children, discussed above.
If a range was provided for number of books in the home, an average was used (e.g., 20-30 was converted to 25). For responses that provided a minimum end of a range (e.g., “100+”), the minimum was used. Verbal responses (e.g., “Lots”, “Hundreds”) were ignored.

Frequency of reading responses were mapped to a 7 point scale based on the number of days per week reading took place (e.g., 3 for 3 days a week). Verbal responses were converted using the rubric shown in Table 2-1. Parental education level was converted to an 8 point scale, as shown in Table 2-2, using a rubric adapted from a previous study (Rowe, Jacobson, & Van den Oord, 1999).

### Tables 2-1 and 2-2. Rubrics for scaling responses for the Frequency of Reading (Reading; left) and Parental Education (Education; right) questions.

<table>
<thead>
<tr>
<th>Score</th>
<th>Reading</th>
<th>Score</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not often</td>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>1</td>
<td>Elementary</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes</td>
<td>2</td>
<td>Middle</td>
</tr>
<tr>
<td>4</td>
<td>Often/Regularly</td>
<td>3</td>
<td>Some high school</td>
</tr>
<tr>
<td>5</td>
<td>Very Often</td>
<td>4</td>
<td>High school graduate/GED</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>5</td>
<td>Some college</td>
</tr>
<tr>
<td>7</td>
<td>Always</td>
<td>5.5</td>
<td>AA degree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>BS/BA degree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>Graduate degree</td>
</tr>
</tbody>
</table>

### Behavioral Measures

As part of a larger set of tasks, a standardized testing battery and an experimental fluency task (described below) were administered. Bilingual children completed the battery in Spanish as well as English and were pseudo-randomly
assigned to “English first” or “Spanish first” groups to determine which battery they received first. Tasks were administered in the same order in each session in a quiet room at the child’s school. An average of 3.5 weeks passed between testing sessions (range 1-7 weeks). English tasks were administered by the author or by a graduate student assistant. Spanish tasks were administered by the author.

**Standardized Measures**

Standardized measures of decoding, expressive vocabulary, oral comprehension, and reading comprehension were administered in English from the Woodcock-Johnson III Tests of Achievement (Woodcock, McGrew, & Mather, 2001) and in Spanish from the Woodcock-Muñoz III Pruebas de Aprovechamiento (Muñoz-Sandoval, 2005). The tasks were selected to evaluate reading ability and the components of reading ability in the two groups and to allow for comparison of results with a number of other studies of bilingual children which also used these measures (Bialystok et al., 2003; Cardenas-Hagan, Carlson, & Pollard-Durodola, 2007; Gottardo, 2002; Lesaux et al., 2007; Mancilla-Martinez & Lesaux, 2010; Nakamoto et al., 2007; Oller & Eilers, 2002; Oller et al., 2007; Proctor et al., 2006; Proctor et al., 2005). All standardized tasks were administered in accordance with the established test protocols, including use of basal and ceiling cut-offs. The outcome measures were raw scores (total number of correct items) from each subtest. The Spanish tasks use different stimuli but have the same design as the English tasks; only the English tasks are described:
1. The “word attack” task measures non-word **decoding**, although the earliest items also evaluated phonemic awareness (e.g., “Point to the letter that makes the sound /p/ as in pig”). The child is then shown non-words based on English spelling conventions (“foy,” “grawl”) and asked to read them out loud.

2. The picture vocabulary test evaluates the child’s expressive **vocabulary**. Children are shown color pictures and asked to name them.

3. The oral comprehension test uses a **cloze** design to assess **oral comprehension** of English. Children hear a sentence and are asked to provide a single word to finish it (e.g., “In the morning we eat breakfast, and in the evening we eat…”).

4. The passage comprehension test evaluates children’s pre-reading and **reading comprehension** abilities. The earliest items ask children to match color drawings to black and white icons (such as a stick figure cat). On subsequent items children must point to a picture that corresponds to a short phrase (e.g., “yellow bird”). The remaining items are written sentences with blanks in them; children must read the sentences and then provide the missing word based on the sentence context (“Ducks like to swim in the ______”).

**The Fluency Measure**

The fluency task indexes children’s speed in decoding real words in English (and Spanish, for the bilingual children). The paradigm was adapted from Joshi and Aaron (2000). Children were presented with a list of words on a computer screen and asked to read each word as quickly and as accurately as possible. High-frequency stimuli were selected to increase the likelihood that children would be familiar with
the words. Items on the English word list had more than 3000 instances per million in the Child Language Data Exchange System database of spoken transcripts from children aged 4:0–8:0 (CHILDES; MacWhinney, 2000), appeared on the Dolch Sight Word Reading List (Dolch, 1936), and were among the 300 most frequent words in the Kucera-Francis corpus (1967) of written English. The words were phonologically regular with the exception of the digraphs “th” and “sh.” None of the words have Spanish cognates.

The Spanish fluency task was presented in the same way as the English fluency task. Instructions were given in Spanish. The words were selected from a list of the 100 most common words in the LEXIN corpus, derived from 134 children’s books written in Spanish (Corral, Ferrero, & Goikoetxea, 2009). Words were phonologically regular with the exception of the digraph “qu” in “que.” Words ranged in length from 1-4 letters, as with the English list, and none of the words were cognates in English. Nine of the words were translations of words from the English list. The complete list of English and Spanish stimuli for the fluency task is shown in Appendix A.

Children were audio recorded using a digital recorder while reading the words. Audio files were opened in Audacity software, which shows a waveform of the audio stream. All data were coded by the author, who was blind to the linguistic status of the children during coding. There were three outcome measures for the English and Spanish versions of the task. **Accuracy** was the percentage of words read correctly. Time from onset of first word to offset of last word was rounded to the nearest tenth of a second and used to generate overall **Time on Task**. Average time per correct word
was used to generate Fluency. The Fluency value used time from the offset of the first word to the offset of the last word, rounded to the nearest tenth of a second. For incorrect words, time from offset of the preceding word to the offset of the incorrect word was subtracted from this total. The result was divided by the total number of items correct, leaving the average time to decode each correct word. Data from children who had 50% or lower accuracy overall were not used for this analysis due to concerns with validity of the result.

The English list consisted of monosyllabic words. Because the Spanish list included four two-syllable words, a fourth measure was generated: Syllabic Fluency. The Spanish Fluency measure for each bilingual child was multiplied by 20 (the number of words in the Spanish list) and divided by 24 (the number of syllables in the Spanish list) to yield a value for Syllabic Fluency. This measure gives the average per syllable fluency rate instead of the average per word fluency rate (note that these two values are equal for the English list since each word is monosyllabic).

Analyses

The preliminary analysis was an ANOVA to evaluate for effects of linguistic status on the demographic measures (from the questionnaire) and effects of age and linguistic status on the linguistic measures (from the standardized and experimental tasks). Two results were of particular interest: 1) differences in demographic measures despite recruiting from the same school, and 2) the presence of interaction effects. The latter would speak to whether bilingual children start or fall behind their monolingual peers. The goal was to determine whether bilingual children maintain a consistent
profile relative to the monolingual children in terms of component skills of literacy and reading comprehension. If bilingual children fall behind, there should be a significant interaction effect for reading comprehension. Despite the cross-sectional nature of the data, this analysis can provide a preliminary evaluation of how literacy interacts with development in bilingual children and set the foundation for longitudinal research. The fluency task was not administered to 10 monolingual and 6 bilingual children who contributed data to a pilot study. Their data were used in the analyses of the standardized measures.

The data were non-orthogonal (e.g., Jennings & Green, 1984), causing ANOVAs to return weighted means instead of true ones. Because the interaction of group with grade was of interest to the hypotheses, the weighted means are reported in the results below. None of the main effects reported were affected by the weighting of means, although in some cases the effect sizes were different.

To examine how SES interacts with linguistic status (i.e., monolingual or bilingual), a subset analysis was also conducted. Children were matched for age, number of books in the home, and parental education. Frequency of reading was not used because it did not correlate significantly with any of the linguistic measures. There were 47 monolingual and 37 bilingual children with complete data. In the bilingual group there were 28 children whose parents reported high school education or higher (the highest levels in the bilingual group). There were 36 monolingual children whose parents had a high school or some college education (the lowest levels in the monolingual group). The 6 monolingual children with the highest reported
number of books in the home were excluded in order to match them to the average number of books in the bilingual group. An additional 4 monolingual children and 2 bilingual children were removed to match the two groups on age. A multivariate ANOVA using linguistic status as the independent variable was then run on the 26 remaining age- and SES-matched children to compare their performance on the linguistic measures.

Results

Incomplete questionnaires were turned in for 3 monolingual and 2 bilingual children. Their data were not used in the SES analyses but were used for the grade and linguistic group analyses on the standardized and fluency measures. Fluency data for 3 monolingual children and 1 bilingual child were not available due to tester error. Another bilingual child’s data from the fluency task was excluded due to low accuracy (10% correct). Data from these children were used on analyses of the standardized measures. Despite having Spanish as a home language, the bilingual children appeared to be mostly English dominant. Their performance on the English vs. Spanish tasks is shown in Appendix B.

The Omnibus Analysis

Means and standard errors for the demographic measures are shown in Table 2-3. The responses to the home information questionnaire revealed clear differences in socio-economic status between the monolingual and bilingual groups on all three demographic measures. Monolingual children had more books in the home [113.4 versus 52.6; F (1,114) = 6.27, p < .014]. They were read to more often [5.1 versus 3.3;
$F(1,114) = 11.98, p < .001$. Monolingual children’s parents also had significantly higher educational attainment [4.9 versus 3.6, $F(1,114) = 35.45, p < .001$]. There was no effect of grade on any of these measures.

Table 2-3. Means and standard errors (SE) for the demographic measures by linguistic status.

<table>
<thead>
<tr>
<th>Status</th>
<th>N</th>
<th>Mean (SE)</th>
<th>Reading Mean (SE)</th>
<th>Education Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon</td>
<td>65</td>
<td>113.42 (20.38)</td>
<td>5.13 (0.32)</td>
<td>4.85 (0.09)</td>
</tr>
<tr>
<td>Bil</td>
<td>51</td>
<td>52.61 (8.71)</td>
<td>3.34 (0.42)</td>
<td>3.55 (0.22)</td>
</tr>
</tbody>
</table>

Table 2-4. Means and standard errors (SE) for the standardized English measures by grade and linguistic status. Mon = Monolingual; Bil = Bilingual. O Comp = Oral Comprehension, R Comp = Reading Comprehension. There were significant effects ($p < .001$) of grade on all measures and of linguistic status on all measures save decoding.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Status</th>
<th>N</th>
<th>Decoding Mean (SE)</th>
<th>Vocabulary Mean (SE)</th>
<th>O Comp Mean (SE)</th>
<th>R Comp Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mon</td>
<td>23</td>
<td>11.96 (1.34)</td>
<td>19.65 (0.67)</td>
<td>13.30 (0.78)</td>
<td>16.96 (0.99)</td>
</tr>
<tr>
<td></td>
<td>Bil</td>
<td>15</td>
<td>9.33 (1.66)</td>
<td>14.87 (0.83)</td>
<td>9.87 (0.96)</td>
<td>12.73 (1.22)</td>
</tr>
<tr>
<td>2</td>
<td>Mon</td>
<td>20</td>
<td>17.05 (1.44)</td>
<td>21.60 (0.72)</td>
<td>16.40 (0.83)</td>
<td>24.95 (1.06)</td>
</tr>
<tr>
<td></td>
<td>Bil</td>
<td>13</td>
<td>17.15 (1.79)</td>
<td>17.54 (0.90)</td>
<td>13.38 (1.03)</td>
<td>20.15 (1.31)</td>
</tr>
<tr>
<td>3</td>
<td>Mon</td>
<td>16</td>
<td>20.25 (1.61)</td>
<td>21.50 (0.81)</td>
<td>15.88 (0.93)</td>
<td>25.75 (1.18)</td>
</tr>
<tr>
<td></td>
<td>Bil</td>
<td>15</td>
<td>21.13 (1.66)</td>
<td>20.13 (0.83)</td>
<td>16.33 (0.96)</td>
<td>23.20 (1.22)</td>
</tr>
<tr>
<td>4</td>
<td>Mon</td>
<td>19</td>
<td>19.21 (1.48)</td>
<td>23.74 (0.74)</td>
<td>22.00 (0.85)</td>
<td>28.21 (1.08)</td>
</tr>
<tr>
<td></td>
<td>Bil</td>
<td>16</td>
<td>20.56 (1.61)</td>
<td>20.19 (0.81)</td>
<td>16.88 (0.93)</td>
<td>26.81 (1.18)</td>
</tr>
</tbody>
</table>

Means and standard errors for the linguistic measures are shown in Tables 2-4 and 2-5. Significant effects of grade were found on all of the linguistic measures: decoding, $F(3,129) = 17.48, p < .001$; vocabulary, $F(3,129) = 13.75, p < .001$; oral
comprehension, F (3,129) = 26.89, p < .001; passage comprehension, F (3,129) = 46.43, p < .001; fluency, F (3,108) = 15.55, p < .001; fluency accuracy, F (3,108) = 10.75, p < .001; and fluency time on task, F (3,108) = 19.76, p < .001. In all cases, children in higher grades outperformed children in lower grades.

Table 2-5. Estimated marginal means and standard errors (SE) for the fluency measures broken down by grade and linguistic status. Mon = Monolingual; Bil = Bilingual. Fluency and Time on Task values are in seconds. Effects of grade are all significant, p < .001. Effects of linguistic status are significant, p < .05.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Status</th>
<th>N</th>
<th>Mean (SE)</th>
<th>Accuracy Mean (SE)</th>
<th>Time on Task Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mon</td>
<td>18</td>
<td>1.03 (0.15)</td>
<td>.96 (0.02)</td>
<td>21.39 (3.12)</td>
</tr>
<tr>
<td></td>
<td>Bil</td>
<td>9</td>
<td>1.65 (0.34)</td>
<td>.85 (0.05)</td>
<td>44.11 (10.74)</td>
</tr>
<tr>
<td>2</td>
<td>Mon</td>
<td>13</td>
<td>.73 (0.08)</td>
<td>.98 (0.01)</td>
<td>14.38 (1.49)</td>
</tr>
<tr>
<td></td>
<td>Bil</td>
<td>11</td>
<td>.89 (0.15)</td>
<td>.97 (0.02)</td>
<td>16.92 (2.65)</td>
</tr>
<tr>
<td>3</td>
<td>Mon</td>
<td>16</td>
<td>.64 (0.06)</td>
<td>1.00 (0.00)</td>
<td>12.82 (1.08)</td>
</tr>
<tr>
<td></td>
<td>Bil</td>
<td>15</td>
<td>.68 (0.05)</td>
<td>.96 (0.01)</td>
<td>13.57 (1.09)</td>
</tr>
<tr>
<td>4</td>
<td>Mon</td>
<td>18</td>
<td>.59 (0.04)</td>
<td>.99 (0.00)</td>
<td>11.65 (0.74)</td>
</tr>
<tr>
<td></td>
<td>Bil</td>
<td>16</td>
<td>.61 (0.03)</td>
<td>.98 (0.01)</td>
<td>12.34 (0.73)</td>
</tr>
</tbody>
</table>

Significant effects of linguistic status were found on all of the linguistic measures aside from decoding: vocabulary, F (1,129) = 37.75, p < .001; oral comprehension, F (1,129) = 18.54, p < .001; passage comprehension, F (1,129) = 15.65, p < .001; fluency, F (1, 108) = 6.36, p = .013; fluency accuracy, F (1, 108) = 12.37, p = .001; fluency time on task, F (1, 108) = 10.01, p = .002. These effects were driven by better performance by the monolingual group relative to the bilingual group (see Figure 2-1).
Figure 2.1. Linguistic group differences for the monolingual (Mon) and bilingual (Bil) groups on the standardized measures. Oral Comp = Oral Comprehension; Read Comp = Reading Comprehension. Group differences are significant for all measures \( p < .001 \) except decoding.

A significant interaction of grade and linguistic status was found for fluency accuracy, \( F (3, 108) = 3.62, p = .015 \); and fluency time on task, \( F (3, 108) = 5.98, p = .001 \). There was also a trend towards an interaction effect on fluency, \( F (3, 108) = 2.65, p = .052 \). Post-hoc analyses revealed that these interactions were due to better performance for the monolingual first grade children relative to their bilingual peers in fluency accuracy and time on task, and a trend towards a significant difference in first grade for fluency. These differences were not present at other grades (see Figure 2-2).

**The SES Analysis**

As described above, a subset of the data from the previous analyses was used to evaluate how controlling for the disparities in SES impacted the results. In addition to being matched for age, the monolingual and bilingual groups were matched for mean number of books in the home and parental education \( p > .40 \) on all measures.
After controlling for SES, there was a significant effect of linguistic status on decoding [16.8 versus 20.9, F(1,50) = 4.52, p = .039] and vocabulary [22 vs. 18.9, F(1,50) = 7.47, p = .009]. There were no other significant linguistic effects. Post-hoc analyses revealed that the monolingual children outperformed the bilingual children on the vocabulary measure. Bilingual children outperformed the monolingual children on decoding (see Figure 2-3).

![Figure 2-2](image.png)

Figure 2-2. Interaction of grade (1 - 4) and linguistic status (Mon = monolingual; Bil = bilingual) for Fluency Time on Task (in seconds). There is a significant difference between the monolingual and bilingual first graders, p = .001, but not at any other grade level.

**Discussion**

This study provides a preliminary picture of the profile of monolingual and bilingual early readers and evaluates how demographic factors interact with the linguistic factors that underpin literacy. Significant differences were found on all three demographic measures despite the fact that the children all attended the same schools. Parents of monolingual children reported having achieved higher levels of education, reading more frequently to their children, and owning more books than parents of
bilingual children. In addition, effects of linguistic status were found on the vocabulary, oral comprehension, reading comprehension, and fluency tasks, but not the decoding task. These effects resulted from better performance by the monolingual children relative to the bilingual children. After controlling for the differences in home SES, however, only the effect for vocabulary remained. In addition, bilingual children had significantly better decoding than monolingual children in the SES-match analysis.

![Figure 2-3](image)

Figure 2-3. Mean performance of the linguistic groups (Mon = monolingual; Bil = bilingual) on the standardized measures after controlling for SES. Oral Comp = Oral Comprehension; Read Comp = Reading Comprehension. N = 26 in both groups. Bilingual children have significantly better decoding than monolingual children, p < .05. Monolingual children have significantly better vocabulary than bilingual children, p < .01.
Initial Reading Skills of Monolingual and Bilingual Children

In general, bilingual children are thought to start behind monolingual children and remain that way throughout their academic careers. However, given the lack of differences typically seen in the two linguistic groups’ decoding ability (Bialystok et al., 2003; Oller & Eilers, 2002; Oller et al., 2007) and the importance of decoding to early reading, it might be predicted that bilingual early readers would perform comparably to their monolingual peers on the reading comprehension measure.

The data presented here do not fit this hypothesis. The two groups had equivalent decoding ability, as expected. Nonetheless, there were significant differences on all of the other linguistic measures: fluency, vocabulary, oral comprehension, and reading comprehension. There was no significant age by linguistic group interaction for reading comprehension, suggesting these differences are relatively stable. Decoding may be a stronger predictor of early reading in monolingual children (e.g., Vellutino et al., 2007) who have highly similar non-phonological linguistic abilities (such as vocabulary and oral comprehension). However, the bilingual children have more variability in their vocabulary and oral comprehension. In contrast to monolingual children, vocabulary and oral comprehension seem to be as important as decoding for bilingual children, even in the early stages of reading.

There was an interaction effect on the fluency task, where significant linguistic group effects were found in the first grade children but not at the later grades. This interaction effect was unexpected. Far from starting off comparably and then falling
behind, the bilingual children appeared to be making strides with age. This outcome may have been due to the ceiling effects in terms of accuracy for the later grades, which may have masked differences in the older children. However, large-scale studies by Lesaux and colleagues compared the number of words read in a minute by fourth (Lesaux et al., 2007) or sixth grade (Lesaux & Kieffer, 2010) monolingual children and bilingual children from diverse linguistic backgrounds and found no differences, consistent with the idea that bilingual children have comparable fluency skills to their monolingual peers in later elementary school. Lesaux and colleagues do not have data at an earlier time point showing significant differences between the two groups, and the bilingual children in those studies were considerably more heterogeneous in home language and culture than the bilingual children in the present study. Nonetheless, their findings support the idea that the null results in the older children were not due to ceiling effects.

The differences between the two linguistic groups in fluency contrast with the lack of differences in decoding. The former task requires decoding of real words, adding a lexical component. Other studies have shown a similar lexical effect in comparing real word decoding to non-word decoding (Oller & Eilers, 2002). This lexical effect is not surprising given the differences between monolingual and bilingual children’s vocabularies. However, it indicates that assessments using non-words may have greater validity for bilingual children in evaluating their decoding ability, as such assessments will not penalize a child for unfamiliarity with a given lexical item.
The Impact of Socio-Economic Status on Early Readers

Effects of linguistic group were found on all of the linguistic measures save for decoding. Given the disparities in SES between the two linguistic groups, however, it was unclear how much these effects were caused by differences in demographic, rather than language, background. To further evaluate this possibility, a subset of the children was matched for age, number of books in the home, and parental education level. The SES-match brought more parity to the two linguistic groups in performance on the language measures. The monolingual children performed significantly better on the English vocabulary measure than the bilingual children, as before. In contrast, the earlier differences in reading comprehension, oral comprehension, and fluency were not found when SES was controlled for, suggesting that these differences were driven more by demographic factors than linguistic status (i.e., monolingual vs. bilingual).

The most interesting finding was that bilingual children outperformed their monolingual peers on the non-word decoding measure. Such a bilingual advantage for decoding does not seem to be attested elsewhere in the literature. Nonetheless, non-word decoding is a strength for bilingual children: it is typically comparable to their monolingual peers and often the only area in which they do not score significantly below monolinguals (e.g., Oller & Eilers, 2002). In other words, bilingual children often have stronger decoding than one would expect based on their language profile.

In addition, a bilingual advantage for phonological awareness is often seen (Bialystok, 2001b; Bialystok et al., 2003; Bruck & Genesee, 1995; Kang, 2012; Kuo & Anderson, 2010; Loizou & Stuart, 2003; Marinova-Todd, Zhao, & Bernhardt,
Phonological awareness is a strong predictor of decoding ability. It is logical that a bilingual advantage in phonological awareness would lead to a bilingual advantage in decoding, although the only study that included phonological awareness and decoding measures (Bialystok et al., 2003) did not find a bilingual advantage for decoding.

The relationship between phonological awareness and decoding in bilingual children is not well understood. Further research is needed to understand what factors contribute to decoding ability in the bilingual group.

**Conclusions**

Bilingual children differ from their monolingual peers in more than just reading ability. They have less robust English comprehension and vocabulary skills. Bilinguals also appear to be significantly slower to decode real words as early readers, although not in older grades.

Even within the same schools, bilingual children come from lower SES backgrounds. These SES differences contribute to the linguistic differences seen between the two groups. School professionals must be very careful in selecting appropriate comparison groups when evaluating bilingual children’s language and literacy abilities.

When discrepancies in SES between monolingual and bilingual children are controlled, bilingual children seem to have an advantage in terms of pure decoding ability. This advantage may be due to increased phonological awareness in bilingual children (Bialystok, 2005), although the relationship between phonological awareness
and decoding in bilingual children is unclear. Nonetheless, reading interventions for bilingual children should emphasize non-phonological linguistic skills such as oral comprehension and vocabulary, as there appears to be no evidence (in this study or others) that decoding is a vulnerable domain in bilingual children.

Follow-up studies are necessary to evaluate the bilingual advantage in decoding. Other studies could compare non-word fluency to word fluency to examine the extent to which the temporal (the time it takes to decode) and lexical (decoding real words vs. non-words) components of the fluency task cause differences between the two groups. In addition, longitudinal data should be collected to further our understanding of how the linguistic profile of bilingual children changes over time.

**Acknowledgements:** This research was supported in part by The Sheila and Jeffrey Lipinsky Family Fellowship in Language and Communicative Disorders. The author is grateful to the schools, teachers, and children who made this research possible. Savanna Gaddis assisted with the data collection. Drs. Keith Rayner and Judy Reilly gave insightful feedback on previous versions of this manuscript.
Appendix A – Word frequencies for the Fluency Stimuli

Stimuli (Word) and frequencies (Freq) for the English fluency task, presented in order of frequency. Frequencies are taken from the CHILDES corpus and are approximations of instances per million words.

<table>
<thead>
<tr>
<th>Word</th>
<th>Freq</th>
<th>Word</th>
<th>Freq</th>
<th>Word</th>
<th>Freq</th>
<th>Word</th>
<th>Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>39449</td>
<td>that</td>
<td>12375</td>
<td>me</td>
<td>6191</td>
<td>want</td>
<td>4074</td>
</tr>
<tr>
<td>the</td>
<td>28808</td>
<td>in</td>
<td>9501</td>
<td>can</td>
<td>5527</td>
<td>with</td>
<td>3952</td>
</tr>
<tr>
<td>and</td>
<td>25160</td>
<td>on</td>
<td>8669</td>
<td>go</td>
<td>5199</td>
<td>put</td>
<td>3945</td>
</tr>
<tr>
<td>it</td>
<td>19293</td>
<td>we</td>
<td>6770</td>
<td>but</td>
<td>4948</td>
<td>see</td>
<td>3586</td>
</tr>
<tr>
<td>he</td>
<td>12635</td>
<td>do</td>
<td>6521</td>
<td>get</td>
<td>4629</td>
<td>she</td>
<td>3146</td>
</tr>
</tbody>
</table>

Stimuli (Word) and frequencies (Freq) for the Spanish fluency task, presented in order of frequency. Frequencies are taken from the LEXIN corpus and are approximations of instances per million words.

<table>
<thead>
<tr>
<th>Word</th>
<th>Freq</th>
<th>Word</th>
<th>Freq</th>
<th>Word</th>
<th>Freq</th>
<th>Word</th>
<th>Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>la</td>
<td>36748</td>
<td>en</td>
<td>16915</td>
<td>para</td>
<td>4423</td>
<td>muy</td>
<td>3651</td>
</tr>
<tr>
<td>y</td>
<td>34908</td>
<td>un</td>
<td>16786</td>
<td>dos</td>
<td>2119</td>
<td>yo</td>
<td>2315</td>
</tr>
<tr>
<td>el</td>
<td>31889</td>
<td>que</td>
<td>10059</td>
<td>si</td>
<td>2237</td>
<td>más</td>
<td>2466</td>
</tr>
<tr>
<td>de</td>
<td>28361</td>
<td>ese</td>
<td>9092</td>
<td>ese</td>
<td>1996</td>
<td>como</td>
<td>2410</td>
</tr>
<tr>
<td>a</td>
<td>19532</td>
<td>con</td>
<td>5077</td>
<td>pero</td>
<td>1174</td>
<td>uno</td>
<td>727</td>
</tr>
</tbody>
</table>
Appendix B – English vs. Spanish performance for the bilingual group

Mean raw scores and standard errors (SE) for the standardized measures for the bilingual group. O Comp = Oral Comprehension. R Comp = Reading Comprehension. There was one bilingual child who could not perform the Oral Comprehension task and another who could not perform the Reading Comprehension task.

<table>
<thead>
<tr>
<th></th>
<th>Decoding</th>
<th>Vocabulary</th>
<th>O Comp</th>
<th>R Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
<td>Spanish</td>
<td>English</td>
<td>Spanish</td>
</tr>
<tr>
<td>Mean</td>
<td>17.10</td>
<td>15.00</td>
<td>18.24</td>
<td>17.47</td>
</tr>
<tr>
<td>SE</td>
<td>1.08</td>
<td>1.09</td>
<td>.51</td>
<td>.76</td>
</tr>
</tbody>
</table>

Means and standard errors (SE) for the English and Spanish fluency measures for the bilingual children. Fluency and Time on Task values are in seconds. Syllabic = Syllabic Fluency for the Spanish task (adjusted for average number of syllables). Note that there is no Syllabic measure for the English Fluency task, as all the English words were monosyllables; the Fluency score reported is equivalent to the a Syllabic score. Fluency data were not available for 6 children; fluency values were not calculated for 9 children with < 50% accuracy.

<table>
<thead>
<tr>
<th></th>
<th>Fluency</th>
<th>Accuracy</th>
<th>Time on Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
<td>Spanish</td>
<td>Syllabic</td>
</tr>
<tr>
<td>Mean</td>
<td>0.87</td>
<td>0.90</td>
<td>0.75</td>
</tr>
<tr>
<td>SE</td>
<td>0.08</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>n</td>
<td>52</td>
<td>38</td>
<td>38</td>
</tr>
</tbody>
</table>
Chapter 3

The Role of Vocabulary in Bilingual Reading
Abstract

Spanish-English bilingual children are a growing proportion of students in U.S. schools. They struggle with acquiring English literacy. The present study explored lexical processing in a cohort of Spanish-speaking children and their monolingual classmates to evaluate how the bilingual children’s English word processing was impacted by their Spanish. Children from first to fourth grades were presented a picture and four words on a touch screen and asked to touch the word that matched the picture. Some targets were cognates (train-*tren*); some distracters shared form with the English target (pig-*pin*) or its Spanish translation (bread-*pan*). The bilingual children were slower to respond in the cognate and false cognate trials. Only the oldest monolingual children were slowed by the form-similar English distracters. The results indicate Spanish influences English word reading even for beginning readers. The possibility of a bilingual advantage for inhibiting within-language competition is discussed.

*Keywords*: Bilingual, Lexical Processing, Vocabulary, Word Reading, School Children
Overview

Spanish-speaking bilingual children (hereafter “bilingual children”) are a growing proportion of U.S. students (Shin & Kominski, 2010) who struggle with reading in English (Lee et al., 2007; NELP, 2008; Restrepo & Gray, 2007). Given the importance of literacy for academic and professional success (Hernandez, 2011; Lloyd, 1978), it is crucial to improve reading outcomes in this group. Research in bilingual adults suggest that letter strings that are words in two languages activate meanings in each, even if the bilingual is only actively using one language at the time (de Groot & Keijzer, 2000; de Groot & Nas, 1991; Dijkstra, 2005, 2007; Dijkstra et al., 1999; Dijkstra & van Heuven, 2002; Kroll & de Groot, 2005; Schwartz & Kroll, 2006; Schwartz et al., 2007; Schwartz et al., under review; Sunderman & Schwartz, 2008; van Hell & Dijkstra, 2002; van Heuven et al., 1998). Word reading is a fundamentally different process for bilingual adults relative to their monolingual peers, as it is influenced not just by characteristics of the language being read but also the bilingual’s other language. It is unclear when in development this profile begins to emerge, and how it is affected by reading proficiency. A number of studies of bilingual children have suggested the presence of positive transfer of vocabulary and phonological awareness across languages (August, Calderón, & Carlo, 2002; Cardenas-Hagan et al., 2007; Cisero & Royer, 1995; Dickinson, McCabe, Clark-Chiarelli, & Wolf, 2004; Ferroli & Shanahan, 1992; Proctor et al., 2006; Rolla San Francisco, 2003). Little research has been done to evaluate the mechanisms that underpin this transfer. For example, bilinguals’ Spanish vocabulary often, but not
always, bootstraps English comprehension in bilingual children (Kelley & Kohnert, 2012; Nagy et al., 1990; Proctor et al., 2006). The present study was designed to explore whether bilingual children’s English reading is affected by their home language, and, if so, in what ways.

**Differences in Components of Reading in Monolingual and Bilingual Children**

*Phonological awareness* is knowledge of the sound structure of spoken words. *Decoding* is the ability to apply sound-spelling correspondences to convert a written word to its spoken form. Vocabulary and phonological awareness are predictors of decoding in monolingual children (Bradley & Bryant, 1983; Ouellette, 2006).

Bilingual children have a distinct reading profile from monolingual children (e.g., Oller et al., 2007). On English testing batteries, bilingual children score significantly lower than monolingual children in phonological awareness and vocabulary (Brice & Brice, 2009; Cisero & Royer, 1995; Oller & Eilers, 2002; Rolla San Francisco et al., 2006), but perform comparably in decoding (Bialystok et al., 2003; Nakamoto et al., 2007; Oller et al., 2007; Woolpert, submitted). This apparent disconnect between phonological awareness, vocabulary and decoding indicates that the process of reading for bilingual children is distinct from that process in monolingual children; otherwise, the relatively low phonological awareness and low vocabulary of bilingual children should lead to low decoding, as it does in monolinguals. This study seeks to explore some of the factors that might cause reading to be different for bilingual children.
Lexical Processing in Bilingual Adults

One obvious difference between monolinguals and bilinguals is that bilinguals have a second lexical system. In order to evaluate whether these two lexicons interact, cognates and false cognates are typically used. Cognates are words that share form and meaning across languages, such as “train” and tren (Spanish words are italicized throughout this document). False cognates share form but differ in meaning, as with “pan” (pan means “bread”). In general, cognates facilitate responses in adults (Costa et al., 2000; de Groot & Keijzer, 2000; de Groot & Nas, 1991; Dijkstra et al., 1999; Schwartz & Kroll, 2006; Schwartz et al., under review; van Hell & Dijkstra, 2002), and false cognates inhibit responses (Dijkstra et al., 1999; Jared & Szucs, 2002). Since bilinguals respond differently to words that share form cross-linguistically than those that do not, their two lexicons appear to interact. As Schwartz, Kroll, and Diaz (2007) put it, “…even when bilinguals are exposed to only one language, they cannot avoid activating lexical information of both of their languages” (p. 107).

The effects of cognates and false cognates can be mitigated by a number of factors, such as linguistic proficiency. Dutch-English-French speakers matched for Dutch and English proficiency but with varying degrees of French proficiency responded to Dutch cognates and non-cognates (van Hell & Dijkstra, 2002). The trilinguals had quicker responses to Dutch words that were English cognates than non-cognates, but only the trilinguals with the most experience in French showed cognate facilitation for French cognates. Likewise, Spanish-English bilinguals were slower to respond to false cognates in English relative to control words, while English-Spanish
bilinguals did not show this effect (Schwartz & Kroll, 2006). The effects of cognates and false cognates in bilinguals are mediated by the proficiency of the participants in the language(s) being tested, suggesting that a bilingual’s two lexicons interact more with experience. If experience impacts the cross-linguistic interaction of a bilingual’s lexicon, it implies that the lexicons do not interact before a certain level of proficiency is reached.

**Lexical Processing in Bilingual Children**

When is this threshold reached in development? Only one study appears to have evaluated bilingual children’s processing of words. Lexical decision tasks were administered to fifth through ninth grade Dutch students being taught English as a foreign language (Brenders et al., 2011). Children were more accurate and quicker in identifying cognates as words than non-cognate controls in English. This effect held for the youngest children, who had only five months of formal English instruction. No cognate effect was seen in Dutch. When cognates and false cognates were included in the English task, children were slower to respond and made more errors on both cognate and false cognate trials relative to control words. Brenders and colleagues suggest that the children overgeneralized their mistrust of false cognates to the cognates as well.

The Dutch bilingual children were experienced readers who have received formal instruction in both languages. The bilinguals in the present study are beginning readers who have received no formal instruction in Spanish. It is unclear whether they will respond to cognates and false cognates in the same way as the Dutch children did.
In a study of fourth and sixth grade bilingual students assessing how cognates impact reading offline, only the children who showed awareness of the cognate status of words were able to use their Spanish knowledge to aid their English reading comprehension (Nagy et al., 1990).

**Within-Language Interference Effects with Reading**

While cross-linguistic lexical processing in children is not well studied, a number of studies have looked at the effects of distracters on monolingual lexical processing. Stroop tasks, for example, ask a child to ignore a written word and to respond to some other visual detail (such as the color of the ink in which it is written). One can certainly imagine a novice reader will be only too happy to focus on the color of the ink, as decoding would be rather laborious. She would need to decode the letters into a series of sounds, then string them together to generate the spoken form. This factor is what caused one group of researchers to exclude five and six year-olds from their study, based on pilot testing revealing that the children’s reading ability is not sufficiently established as an automatized activity” (Comalli Jr. et al., 1962 p. 48) Likewise, a study of first, third and sixth grade children showed that, while the first grade children were slowest overall, they also had the smallest Stroop effect (Posnansky & Rayner, 1977). When categorizing words with other words embedded in them (such as “crow” in “crown”), seven year-old children were significantly slower and less accurate to reject a category that matched the embedded word (types of animal) than one that matched neither (body parts; Nation & Cocksey, 2009), indicating that as early as second grade, semantic associations with written words are
strong enough to create interference effects in orthographic processing. While not well studied in children, orthographic similarity also creates within-language competition. Specifically, responses to visually present words that come from dense orthographic neighborhoods (that have many other words spelled similarly) are typically slowed compared to words from sparse neighborhoods (Andrews, 1997; Carreiras, Perea, & Grainger, 1997; Lavidor & Ellis, 2002; van Heuven et al., 1998).

As reading becomes more automatized, it also becomes susceptible to disruption. Inexperienced readers are not vulnerable to the same kinds of within-language interference during word reading as more experienced readers. It is unclear whether novice readers are less vulnerable to cross-language interference, as well.

**Hypotheses**

This study sought to explore how the unique profile of bilingual children impacts their reading. Specifically, does Spanish impact English lexical processing in early readers as it does in adults, as indicated by differential response to cognates and false cognates? Does the less robust English vocabulary of bilinguals make disambiguating form-similar words in English more difficult than for their monolingual peers? How does the increasing automaticity of reading with age alter the way children process words?

To address these questions, children were administered an online task via a touch screen in which they needed to select one of four words that corresponded to a picture (described in further detail below). Some of the distracters shared form with
the English target (e.g., pig-pin) or its Spanish translation (e.g., bread-pan). Some of the targets were cognates (e.g., train-tren).

The specific hypotheses for the study were:

- Developmental Hypothesis: effects of age on the children’s performance will be seen, such that older children (regardless of linguistic status) will have quicker reaction times and higher accuracy than younger children in English word processing. The older children will also be more susceptible to the effects of form-similar distracters, both within (pig-pin) and across (pan-pan) languages.

- Linguistic Hypothesis: bilingual children’s performance will be affected by words that share form cross-linguistically. Both cognates and false cognates will slow responses, but cognates will increase accuracy and false cognates will decrease it.

- Disambiguation Hypothesis: bilingual children will have slower reaction times and lower accuracy when selecting a target word from a field of form-similar distracters, due to their smaller English lexicon.

Participants

Children were first through fourth grade students recruited from two schools in southern California as part of a larger study. Monolingual children only had English in the home per school records and parent report. Bilingual children had Spanish as a primary language in the home per school records and parent report. Children with a history of speech-language disorders or reading problems were excluded.

There were 68 monolingual and 66 bilingual children who met criteria for inclusion in the study. Bilingual children were administered a screening battery of four
tests from the Woodcock-Muñoz III Pruebas de Aprovechamiento (Muñoz-Sandoval, 2005) to evaluate Spanish proficiency. The battery consisted of non-word reading, reading comprehension, expressive vocabulary and oral comprehension tasks. There were 13 bilingual children who could not complete the screening battery. These students were excluded from further testing. Despite having Spanish as their first language, the bilingual children in this study were found to be English-dominant on the whole (for further details, see Woolpert, in preparation). English reading and vocabulary were assessed with the Woodcock-Johnson III Tests of Achievement (Woodcock et al., 2001). Data from 2 monolingual children was not available due to tester error. Data were included from 66 monolingual (mean age 8.3 years, S.E. = .15) and 53 bilingual children (mean age 8.3 years, S.E. = .14). The number of children in each group at each grade is shown in Table 1 of the Results.

The Lexical Processing Task

The lexical processing task was administered on a PC running Presentation software (Neurobehavioral Systems, San Francisco, CA) in a quiet room at their school. A picture and four words were presented on a 21” Compaq touch screen monitor. Children were told in English to touch the word that matched the picture as quickly and accurately as they could, as part of a larger testing battery. Outcome measures were accuracy and reaction time.

The task began with a training phase. The child was told to “touch the picture on the outside that matches the one in the middle.” The child saw a + as a fixation
point 200 ms before the five pictures appeared. Feedback was given as needed (e.g., “Make sure you touch the picture on the outside that matches the one in the middle”).

During the experimental phase, the child was told that the picture would have four words around it and to touch the word that matches the picture “as quickly and as accurately as you can.” The child saw a + as a fixation point in the center of the screen 200 ms before the picture and four words appeared. The task was self-paced: after a child made a selection, an icon appeared for the child to touch when she was ready for the next trial.

There were four pseudo-random presentation lists created, with order and location counterbalanced across trials. Each list had 60 trials. The first six trials were from the training condition. The next 24 trials were drawn from the experimental conditions. First grade children were given a break at this point. The remaining six training trials and 24 experimental trials were then presented.

**Stimuli**

Picture stimuli were high-resolution black and white line drawings from the International Picture Naming database that have been matched for complexity, contrast, and cross-cultural validity (Bates et al., 2003). In the training phase, pictures appeared in a 200 pixel square area. In the experimental conditions, pictures were presented in a 300 pixel square area. Words were presented in lowercase 28 point Times New Roman font. Pictures used in the motor control trials were not used in experimental trials.
There were four experimental conditions: baseline, cognate, false cognate and orthographic. At least one distracter in each condition began with the first two letters of the target (such as “bed” for “bell”), which served as an orthographic foil for the target and to prevent a strategy of focusing on the initial sound(s) and disregarding the remaining letters.

* Insert Figure 3-1 About Here *

Target words in each condition were highly-imageable nouns matched for frequency and length (in letters). Frequency values were obtained using the ChildFreq tool (Bååth, 2010), which searches the Child Language Data Exchange System (CHILDES; MacWhinney, 2000) database of children’s spoken language transcripts. Words were matched based on frequency in transcripts from children aged 4;0-7;11. Using a child language corpus to determine word frequencies was deemed most appropriate given the age of the participants.

Distracter words were highly-imageable nouns matched in length and frequency to the targets. Mean frequency and length of words is presented in the Appendix. Univariate ANOVAs returned no effect of condition on target length, $F(3,44) = 1.01, p = .39$; or target frequency, $F(3,44) = .123, p = .95$.

**The Baseline Condition**

The baseline condition tested the child’s ability to map meaning to a written word with minimal interference. This condition featured a target word (e.g., “dog”), an orthographic distracter (e.g., “doll”), and two semantically- and orthographically-unrelated distracters (e.g., “rain” and “mud”). Note that this condition is not a true
baseline condition, as one of the distracters generates orthographic interference. This
distracter was included to encourage reading all the words, as children could
potentially develop a strategy of just scanning for the beginning of the target word in
each trial.

The Cognate Condition

The cognate condition tested the effects of Spanish cognates on reading in
English. Targets in this condition were cognates (e.g., “train” and tren), selected from
the NTC Dictionary of Cognates (Nash, 1997) and an online search. Otherwise, this
condition was identical to the baseline condition, with an orthographic distracter (e.g.,
“trash”) and two unrelated distracters (e.g., “witch” and “elbow”).

The False Cognate Condition

The false cognate condition evaluated how false cognates interfered with
bilingual children’s reading. This condition had one distracter that was highly similar
in form, but not meaning, to the target word’s Spanish translation (see Figure 1). Each
trial also had an orthographic distracter (“ham” for target “hand”) and an unrelated
distracter (e.g., “pot”). False cognates were selected from the NTC Dictionary of False
Cognates (Prado, 1993) and an online search.

The Orthographic Condition

The orthographic condition increased the demands on the child’s decoding
abilities and lexical system by using targets and distracters that were highly form-
similar in English. In each trial, all words shared at least two letters at their onset. For
example, for target “pig,” the distracters were “pin,” “pit” and “pill.”
Analyses

Reaction time, in milliseconds, was taken from the Presentation log files. Accuracy was the percentage of correct responses in the experimental trials. Reaction times +/- 2.25 standard deviations from the participant’s overall mean response time for that condition (4.5% of all trials) were excluded from analyses. Reaction times from trials with an incorrect response (6.4% of all trials) were also excluded.

There were three primary categories of analyses: between-groups comparisons of performance between the younger and older children, between-groups comparisons of performance of bilingual children relative to monolingual children, and within-groups analyses of performance on the experimental conditions relative to their respective baselines. Because the data are not distributed equally across grades or linguistic groups, accuracy and reaction times were analyzed using separate ANOVAs for grade and for linguistic group. For the within-group comparisons, paired-samples t-tests were conducted to determine if there were significant differences between each child’s mean performance in an experimental condition and the baseline condition. The within-group analyses were of particular interest because they controlled for individual differences in motor response, reading ability, etc. to isolate the effect each condition had on the individual children.

Reaction times from an additional 6 monolingual and 5 bilingual children were excluded because the children scored at or below 75% overall accuracy, raising concerns regarding accurate measurement of condition effects. However, their scores were included in the accuracy analyses, as there was a concern that accuracy in the
younger children might not be fairly represented if low scores were excluded from accuracy analyses. Thus, 66 monolingual and 53 bilingual children contributed to the accuracy analyses, and 60 monolingual and 48 bilingual children contributed to the reaction time analyses.

Results

Between Groups Comparisons

Mean accuracy scores are reported in Table 1. There was a significant effect of grade on accuracy, $F = 9.85, p < .001$, but no significant effect of linguistic status on accuracy. Post-hoc comparisons revealed significant differences in accuracy between the first grade group and all other grade groups: 85.6% vs. 96.3% (second grade), 97.9% (third grade), and 96.0% (fourth grade); $p < .001$ in all cases. Differences between the other grades were not significant.

* Insert Table 3-1 About Here *

Mean reaction times are shown in Table 2. Older children were significantly faster than younger children in all conditions. The effects of grade were highly significant in all conditions, $p < .001$. While bilingual children were slower than monolingual children at each grade and in each condition, these differences were not significant in any condition. However, as mentioned previously, comparison of overall group means does not appropriately account for individual differences as the within-groups comparisons do. Those analyses are presented next.

* Insert Table 3-2 About Here *
Within-Groups Comparisons

Paired samples t-tests were run on the bilingual and monolingual children’s data to examine within-groups differences. Specifically, differences in reaction time between the baseline and each of the experimental conditions were examined. Mean differences in reaction time are reported in Table 3. These differences will be referred to as effects for a given condition.

* Insert Table 3-3 About Here *

In the monolingual group, there were no significant effects for any of the experimental conditions. In the bilingual group, there were significant cognate [2699.7 versus 2545.4 ms, $t(47) = 2.07, p = .044$] and false cognate [2851.2 versus 2545.4 ms, $t(47) = 2.52, p = .015$] effects, but no orthographic effect. In both cases, bilingual children responded more slowly in the experimental conditions than baseline (see Figure 2).

* Insert Figure 3-2 About Here *

To examine whether age impacted the children’s response profile, first and second grade children and third and fourth grade children were placed into two separate groups and the analyses re-run. There were no significant effects for either the older ($n = 30$) or younger ($n = 28$) monolingual children. In the younger bilingual group ($n = 18$), there was a trend towards a false cognate effect [3795.5 versus 3231.9
ms, $t(17) = 1.89, p = .08]$. In the older bilingual group ($n = 30$), there was a significant false cognate effect [2284.5 versus 2133.4 ms, $t(29) = 2.25, p < .05$].

There was a concern an orthographic effect may have been masked by the high degree of variability across grades. In particular, it seemed possible that the long reaction times of the younger children might be masking a subtle orthographic competition effect. As such, *post-hoc* paired samples t-tests were run to determine if there was an orthographic effect within each grade. The t-test was significant for the fourth grade group only [2036.27 versus 1903.8 ms, $t(32) = 2.73, p < .01, n = 33$]. In a follow-up t-test splitting the fourth graders up by linguistic status, the orthographic effect was significant in the monolingual group ($n = 17$), $t(16) = 4.28, p = .001$, but not the bilingual group ($n = 16$), $t(15) = 1.52, p > .05$ (see Figure 3). This effect was still significant even when using a Bonferroni correction of $p = .008$.

* Insert Figure 3-3 About Here *

To review: the bilingual children showed the strongest effects in the false cognate condition as well as an overall cognate effect. The cognate effect was one of interference rather than facilitation. As expected, the cross-linguistic conditions did not affect the performance of the monolingual children. *Post-hoc* analyses revealed a significant orthographic effect for the monolingual fourth graders only, indicating their responses were significantly slower with the increased number of orthographic competitors in the orthographic condition.
Discussion

This study sought to explore how the specific profile of bilingual children impacted their English reading, and whether early bilingual readers process words differently than early monolingual readers. There were three hypotheses, predicting (1) that effects would be stronger in the older children relative to the younger children, (2) cognate and false cognate effects for the bilingual but not the monolingual children, and (3) orthographic effects for the bilingual but not the monolingual children. How well these hypotheses were supported by the data is discussed below.

The Importance of Development to Reading

The first hypothesis was a developmental one: that older children in both groups would have higher accuracy and quicker reaction times than the younger children. These data are cross-sectional, so these results should be interpreted with caution. Nonetheless, older children outperformed younger children in both speed and accuracy. In the case of the bilingual children, the fourth graders were approximately twice as fast as the first graders. This parallels findings from a timed decoding task showing significant differences between the two linguistic groups in first grade only (Woolpert, in preparation). Both results suggest that bilingual children lag behind their monolingual classmates in speed of English lexical processing early on, but catch up to them later. Note that this finding stands in contrast to offline measures of decoding in bilinguals, which appear to be robust at all age levels (e.g., Oller et al., 2007).

The inhibitory effect for false cognates appeared to get stronger with age, paralleling outcomes in monolingual children on Stroop tasks (Comalli Jr. et al., 1962;
Posnansky & Rayner, 1977). While there was only a trend for a false cognate effect in the younger bilingual children, the effect was significant in the older bilingual children. Note, however, that there were fewer children in the younger group than the older group. It is possible that the result would have been significant had there been more younger children in the cohort. Such a result would suggest that the false cognate effect remains steady with age, and parallel findings in older bilingual children (Brenders et al., 2011).

**The Effect of Spanish on Bilingual Children’s English Word Processing**

Bilingual children’s performance on the present task was hypothesized to be affected by their Spanish lexicon, as reflected by their performance in the cognate and false cognate tasks. Specifically, increased accuracy and slowed responses were predicted in the cognate condition, and decreased accuracy and slowed responses were predicted in the false cognate condition. No effect on monolingual children’s performance was predicted for these conditions.

As predicted, monolingual children showed no effects for the cognate or false cognate conditions. In addition, bilingual children were slower to respond in both conditions. This study is the first to show that bilinguals’ processing of words is affected by the cognate status of lexical items at such a young age. The results suggest that bilinguals’ reading is distinct from monolinguals’ even in the earliest stages of literacy acquisition, and underscores the need for reading materials designed specifically with bilingual children in mind. The finding of interactivity of the bilingual lexicon at such a young age is more striking when considering the children
were being tested in English, in an environment where they predominantly use English, which one would expect to increase inhibition of the unused language (i.e., Spanish).

Contrary to expectations, there was no effect of linguistic status on accuracy in any of the conditions. More challenging stimuli may have revealed differential performance in the cognate and false cognate conditions for the bilingual children (note that even the first grade bilingual children had mean accuracy of 80% across all conditions). Likewise, bilingual children in this study were English-dominant; more variability in accuracy might have been seen in a Spanish-dominant cohort.

The cognate disruption effect conflicts with previous research suggesting cognates should bootstrap reading in bilingual children (e.g., Kelley & Kohnert, 2012; Proctor et al., 2006). The stimuli in this study were high-frequency English words. Latinate vocabulary that is low frequency in English and high frequency in Spanish (such as “infirm”/enfermo) may be more likely to show cognate facilitation effects (Bravo et al., 2007). Cognate facilitation would also be expected in a paradigm that did not include false cognates (q.v. Brenders et al., 2011).

**Disambiguation of Words That Share Form**

Contrary to expectation, there was no orthographic effect in the bilingual children, nor for the majority of monolingual children. Only the monolingual fourth graders were slower, relative to baseline, in distinguishing between the words that shared form within-language (pig-pin). Because this effect was contrary to expectations and was only revealed through *post-hoc* analyses, it must be interpreted
with caution. Nonetheless, the evidence suggests that trouble discriminating between words that are form similar within a language is a hallmark of skilled, rather than unskilled, reading, as the monolingual fourth graders had the quickest absolute reaction times in the study, even though they were relatively slower in the orthographic condition. While the inclusion of an orthographic distracter in other conditions may have masked the presence of subtler orthographic effects at other grades or in the bilingual group, there is no reason to believe the monolingual fourth graders would not have appeared even slower, relative to a baseline with no orthographic distracter.

There are two ways to interpret the lack of a corresponding orthographic effect for the bilingual fourth-grade children. Since the presence of the orthographic effect seems to indicate reading proficiency, it is possible the bilingual children are continuing to lag behind their monolingual peers in subtle aspects of word reading, such that word processing is less automatic at fourth grade. Alternately, the bilinguals may be more skilled at inhibiting competing options due to the interaction between their lexicons: any word they know in both languages will be represented twice in their mental dictionary, at least at the phonological level (e.g., Francis, 2005). The bilingual children’s Spanish was active while they were reading in English, as indicated by the cognate and false cognate effects. This, in turn, suggests that as they learn to read in one language, they must also learn to inhibit competition from the other. Bilingual advantages in inhibiting competing information have been reported for adults (e.g., Bialystok, Craik, & Luk, 2008; Prior & MacWhinney, 2010). In
addition, this explanation is more parsimonious with other data from this cohort that suggest the first grade bilingual children lag behind in reading fluency, but these differences resolve in the older children (Woolpert, in preparation).

Conclusions

The present study sought to evaluate whether reading is a fundamentally different process for bilinguals than for monolinguals, and, if so, in what ways it was different. When presented with English words that were similar to Spanish words, the bilingual children were slower to respond than when presented with words that were dissimilar. The monolingual children did not show this effect. The oldest monolingual children were slowed by words that were highly form-similar within English. This effect was not seen in the bilingual group, either because they were not as robust in orthographic processing or due to a bilingual advantage for inhibiting within-language competition.

The results indicate that, at the word level, a bilingual’s reading is distinct from a monolingual’s. While bilingual children may benefit from cognates in offline reading comprehension tasks (Kelley & Kohnert, 2012; Nagy et al., 1990), the activation of lexical information from a competing language may disrupt fluent reading. Moreover, the disruptive effect of false cognates in the bilingual children suggests why these children do not always benefit from Spanish-English cognates when reading: the presence of false cognates may cause the children to doubt the meaning of true cognates. A child who learns that mesa means “table,” and not “mess,” is less likely to consider pera to mean “pear.” Explicit instruction in
similarities and differences between English and Spanish lexical items would be the best way to increase the benefit and minimize the interference of the children’s Spanish knowledge on their English reading.

Further research is necessary to evaluate whether the bilingual children are better at inhibiting within-language competition than their monolingual peers. Manipulating the orthographic and phonological similarity of Spanish-English cognates can indicate how much the different aspects of Spanish contribute to the interference (e.g., Schwartz et al., 2007). Follow-up studies are needed to explore how the interaction between the Spanish and English lexicons affects reading at the sentential and discourse levels in bilingual children. Such research can also explore how this impact may be mitigated by linguistic proficiency or an intervention focused on increasing awareness of true and false cognates.

**Acknowledgements:** This research was supported in part by The Sheila and Jeffrey Lipinsky Family Fellowship in Language and Communicative Disorders. The author is grateful to the schools, teachers, and children who made this research possible. Savanna Gaddis assisted with the data collection. Lara Polse provided considerable help in getting the experiment up and running. Dr. Tabitha Woolpert gave assistance with the data analysis. Drs. Keith Rayner and Judy Reilly gave insightful feedback on previous versions of this manuscript, and Dr. Henrike Blumenfeld provided useful suggestions in the development of the experiment and analysis of the data.
Appendix - Frequency and length of target words and distracters in the four experimental conditions

Frequency is mean instances per million based on values returned by the ChildFreq tool. Length is mean number of graphemes (i.e., letters) per word. Values for target words are in boldface. D-Frequency = Distracter Frequency; D-Length = Distracter Length.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Frequency</th>
<th>Length</th>
<th>D-Frequency</th>
<th>D-Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>166</td>
<td>4.8</td>
<td>164.6</td>
<td>4.8</td>
</tr>
<tr>
<td>Cognate</td>
<td>149</td>
<td>4.9</td>
<td>164.9</td>
<td>5</td>
</tr>
<tr>
<td>False Cognate</td>
<td>185.5</td>
<td>5</td>
<td>177.1</td>
<td>4.8</td>
</tr>
<tr>
<td>FC Distracter</td>
<td>187.6</td>
<td>4.1</td>
<td>194.5</td>
<td>4.2</td>
</tr>
<tr>
<td>Phonological</td>
<td>149.5</td>
<td>4.2</td>
<td>149.8</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Note: Because half of the unrelated distracters in the false cognate condition were matched in length to the target words, and half were matched to the false cognate distracter (FC Distracter), means for both sets of unrelated distracters are listed. FC Distracter is not its own condition but rather an aspect of the False Cognate condition.
Table 3-1. Means and standard errors (SE) for Accuracy (across conditions). There was a significant effect of grade on accuracy, $p < .001$, but no significant effect of linguistic status.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Monolingual (N)</th>
<th>SE</th>
<th>Bilingual (N)</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>88.4% (19)</td>
<td>3.3%</td>
<td>80.3% (11)</td>
<td>6.1%</td>
</tr>
<tr>
<td>2</td>
<td>97.4% (13)</td>
<td>0.9%</td>
<td>94.9% (11)</td>
<td>2.2%</td>
</tr>
<tr>
<td>3</td>
<td>98.8% (14)</td>
<td>0.3%</td>
<td>97.1% (15)</td>
<td>1.4%</td>
</tr>
<tr>
<td>4</td>
<td>94.4% (18)</td>
<td>2.1%</td>
<td>97.8% (16)</td>
<td>0.5%</td>
</tr>
</tbody>
</table>
Table 3-2. Mean reaction times in milliseconds by condition, group, and grade. SE = Standard errors. FalseCog = False Cognate. Each row represents a different grade. There was a significant effect of grade on reaction time in each condition, p < .001.

<table>
<thead>
<tr>
<th>Grade (N)</th>
<th>Baseline</th>
<th>Cognate</th>
<th>FalseCog</th>
<th>Phonol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SE</td>
<td>Mean</td>
<td>SE</td>
</tr>
<tr>
<td>1 (16)</td>
<td>3182.7</td>
<td>299.2</td>
<td>3338.8</td>
<td>259.6</td>
</tr>
<tr>
<td>2 (13)</td>
<td>2466.3</td>
<td>217.0</td>
<td>2484.2</td>
<td>249.9</td>
</tr>
<tr>
<td>3 (14)</td>
<td>2262.1</td>
<td>97.2</td>
<td>2091.7</td>
<td>77.5</td>
</tr>
<tr>
<td>4 (17)</td>
<td>1871.8</td>
<td>109.7</td>
<td>1902.9</td>
<td>84.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade (N)</th>
<th>Baseline</th>
<th>Cognate</th>
<th>FalseCog</th>
<th>Phonol</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>Mean</td>
<td>SE</td>
<td>Mean</td>
<td>SE</td>
</tr>
<tr>
<td>1 (7)</td>
<td>3787.9</td>
<td>654.3</td>
<td>4370.0</td>
<td>857.5</td>
</tr>
<tr>
<td>2 (11)</td>
<td>2878.2</td>
<td>366.3</td>
<td>2946.0</td>
<td>475.7</td>
</tr>
<tr>
<td>3 (14)</td>
<td>2356.9</td>
<td>191.7</td>
<td>2456.7</td>
<td>233.6</td>
</tr>
<tr>
<td>4 (16)</td>
<td>1937.9</td>
<td>89.0</td>
<td>2012.3</td>
<td>107.4</td>
</tr>
</tbody>
</table>
Table 3-3. Means and standard errors (SE) for differences in reaction time by group. Diff= Difference. Negative numbers indicate faster performance in the experimental condition relative to baseline. * = significantly different from baseline, p < .05.

<table>
<thead>
<tr>
<th></th>
<th>Cognate Diff</th>
<th>False Cognate Diff</th>
<th>Phonological Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SE</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>Monolingual</strong></td>
<td>14.57</td>
<td>48.70</td>
<td>74.18</td>
</tr>
<tr>
<td></td>
<td>-0.98</td>
<td>63.03</td>
<td></td>
</tr>
<tr>
<td><strong>Bilingual</strong></td>
<td>154.32*</td>
<td>74.62</td>
<td>305.78*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45.60</td>
</tr>
</tbody>
</table>
Figure 3-1: example trial from the false cognate condition. Children were asked to touch the word that matched the picture (“bread”).
Figure 3-2. Difference in reaction times (in ms) between Baseline and the Cognate and False Cognate conditions in the Monolingual (Mon) and Bilingual (Bil) groups. Comparisons are within, rather than between, groups. * = significantly different from 0, p < .05.
Figure 3-3. Difference in reaction times (in ms) between the Phonological and Baseline conditions, by grade and linguistic group. Comparisons are within, rather than between, groups. *** = significantly different from 0, p < .001.
Chapter 4

Written Expression in Early Readers
Abstract

Many studies have examined reading in bilingual children. Few studies, however, have focused on their writing. Given the emphasis on writing in the new Common Core State Standards, there is an urgent need for high-quality research on the written language in this group. The participants in the present study were 200 first through fourth grade students: 100 Spanish-speaking bilinguals and 100 of their monolingual classmates. The students’ written narratives were analyzed on measures of productivity, complexity, and accuracy. The bilingual children performed as well as the monolingual children on productivity and complexity measures but not the accuracy measures. Specifically, significant differences were seen in proportions of phonologically plausible spelling errors, lexical errors, and morphological errors. When a subset of the cohort was matched for home socio-economic status (SES), only the difference in proportion of spelling errors persisted. In addition, the bilingual children were found to make fewer pronoun errors than their monolingual peers. The results indicate that orthography, vocabulary and morphology are the most vulnerable domains in the bilingual children’s writing. The possibility of a bilingual advantage in pronoun use is discussed.

Keywords: Bilingual, Writing, Narratives, Socio-economic status, School Children
Overview

Literacy research generally focuses on reading, leaving written expression under-studied. Particularly lacking is quality research on writing in Spanish-English bilingual children (August & Shanahan, 2006; Danzak, 2011; Fitzgerald, 2006; Harklau, 2002; Soltero-González et al., 2011). Given the emphasis on writing in the new Common Core State Standards for U.S. schools (CCSS; Council of Chief State School Officers & the National Governors Association Center for Best Practices, 2011; Graham, Gillespie, & McKeown, in press), there is an urgent need for more research on writing in bilingual children. Recent research on the reading of bilingual children has compared them to monolingual children to uncover a profile of relative strengths and weaknesses (Oller et al., 2007; Pasquarella, Gottardo, & Grant, 2012). Likewise, this study compares bilingual and monolingual children's written narrative abilities – not to belabor differences between the two groups (e.g., Nakamoto et al., 2007; Oller & Eilers, 2002), but to evaluate which domains of written English seem to present the largest obstacles to academic success in bilingual children. The present study examines children’s writing using three dimensions of analyses: productivity, complexity, and accuracy (Koutsoftas & Gray, 2012; Mackie, Dockrell, & Lindsay, in press; Puranik, Lombardino, & Altmann, 2008). Broadly speaking, productivity measures are quantitative measures of output; complexity measures evaluate the linguistic sophistication of the writing; and accuracy examines how well the writing follows written conventions. It is hoped that the analyses will help school staff will be better able to serve the needs of bilingual children when it comes to writing. In
addition, evaluating written expression in this group may provide further insight into their reading difficulties. Finally, this study seeks to examine how socio-economic status mediates writing performance in bilingual children.

Written Development in Monolingual Children

Learning to write is one of the major linguistic challenges of school age, as many children enter school with minimal formal writing ability (Kroll, 1981). However, even pre-school children demonstrate awareness of how writing is different from drawing (Treiman & Bourassa, 2000). Around kindergarten age, children are able to distinguish letters from letter-like symbols (Lavine, 1977). Early writers typically use the same forms in their writing as they do in speech; during elementary school, children start using structures unique to writing (Kroll, 1981). At the same time, children begin to acquire the alphabetic principle: that spelling is meant to encode the phonology of a word (Ehri, 2000; Treiman & Bourassa, 2000).

Inspired by the adult model of writing by Hayes and Flowers (1980), Berninger and colleagues (Berninger, 1994; Berninger & Swanson, 1994) generated a model of writing in children that included four domains of writing: 1) transcription (handwriting and spelling), 2) planning, 3) text generation (i.e., word selection and sentence structure) and 4) revision. As children develop, their writing becomes more sophisticated. Older children’s written narratives, for example, have more words, more words per clause (clausal density), and more story grammar, including more complete settings (Berman & Katzenberger, 2004; Berman & Verhoeven, 2002b; Loban, 1976; Nelson, Bahr, & Van Meter, 2004; Nippold et al., 2005). Story grammar is knowledge
and use of structural elements of a narrative, such as setting, conflict, and resolution (Mandler & Johnson, 1977; McCabe & Peterson, 1991). Nippold and colleagues (2005) found that adult writers use more complex syntax, such as adverbial clauses and metalinguistic verbs (such as think and say), than children or adolescents. Other studies (Hunt, 1965; Verhoeven et al., 2002) have revealed that as children age, their writing shifts from reliance on coordinating conjunctions (The boy tripped and he fell down) to marking causality (The boy fell down because he tripped) and temporality (The boy fell down after he tripped).

**Written Narratives in Bilingual Children**

Little is known about writing in bilingual children. In 2006, August and Shanahan wrote that research on writing in bilinguals is “extremely sparse” and that “much more research” is necessary (p. 169). Many of the studies that do exist are observational, presented as case studies (e.g., Hernandez, 2001; Serrano & Howard, 2007), or lack large sample sizes and a comparison group (e.g., Edelsky, 1982).

Only two studies appear to have evaluated differences between writing in monolingual and bilingual children. McClure and Platt (1988) studied the written narratives of 80 upper class children in 4th and 9th grades. The monolingual and bilingual children attended different schools. The monolingual children used more subordination, participles, and temporal adverbs than the bilingual children. Lack of verb tense marking was highlighted as the primary difference between the two groups’ narratives. In contrast, Carlisle (1989) found no significant differences in error rate in the writing of late elementary school monolingual and bilingual children, but spelling,
morphosyntactic, punctuation and capitalization errors were included in a single category, which may have masked specific differences. No effects of linguistic status were found on measures of productivity (total number of words) or clausal density (number of words per t-unit) in the study, either.

One factor which may help bilinguals’ writing is that they are typically equal to their monolingual peers in decoding (non-word reading) ability (Oller et al., 2007). Decoding is highly predictive of spelling ability (Ehri, 2000), suggesting that spelling will also be a strength for the bilingual children. In addition, decoding has been found to be one of many significant factors predicting narrative quality (Olinghouse, 2008).

The Link Between Reading, Spoken Narratives, and Written Narratives

Writing development and its relationship to reading is not well understood (Graham et al., in press). Many studies, however, have explored the relationship between spoken narrative measures and reading ability. For example, literate language features are a collective of linguistic structures, such as adverbs and conjunctions, hypothesized to be more present in the spoken language of children more familiar with the “literary style” found in books (Curenton & Justice, 2004; Eisenberg et al., 2008; Greenhalgh & Strong, 2001). The presence of literate language features in spoken narratives has been found to be predictive of later reading ability in monolingual children (Greenhalgh & Strong, 2001). Note that literate language features require not just a familiarity with books but also proficiency with the language in question. In contrast, story grammar is fairly universal, and not considered to be language specific (Berman & Slobin, 1994). Use of “story grammar” in a spoken narrative is also

In a study exploring the relationship between spoken narrative measures and reading in bilingual children, measures like clausal density, number of different words (NDW), and narrative quality were found to predict a quarter of the variability in reading comprehension in a cohort of 1500 bilingual children (Miller et al., 2006). No study appears to have examined how the presence of literate language features or story grammar elements in children’s writing might be associated with their reading ability. This gap in the literature is a bit surprising, as reading and writing are strongly associated (Ehri, 2000). A recent meta-analysis found that increasing the amount that a child writes increases their reading comprehension (Graham & Hebert, 2011). The present study examines how the presence or absence of literate language features and elements of story grammar in the writing of bilingual children indicates areas in most need of help. For example, a difference between the two linguistic groups (monolingual and bilingual) in the complexity of their story grammar would suggest a lack of familiarity with the narrative style of stories in any language, whereas a difference in literate language features is more suggestive of a lack of knowledge of written English linguistic conventions.

**Demographic Variables in Bilingual Children**

A contradiction exists in the bilingual research. Numerous studies, including some mentioned above, reveal bilinguals to be at a disadvantage in a variety of linguistic domains relative to monolinguals. In the earliest studies of bilingualism, this
result was thought so well-established that researchers claimed being raised with two languages to be a “mental handicap” (Dunn, 1988; Garretson, 1928; Garth, 1925; Harvey, 1949; Saer, 1923) More recently, studies have revealed “bilingual advantages” in linguistic skills such as phonological awareness (Bialystok et al., 2003) novel word learning (Kaushanskaya & Marian, 2009), and grammaticality judgment (Galambos & Goldin-Meadow, 1990) relative to monolinguals. In addition, bilinguals are often found to outperform monolinguals in non-linguistic tasks (for a review, see Bialystok, 2005).

These results seem contradictory: how can bilingualism be both a detriment and a boon at the same time? The early studies of bilingualism did not control for differences in socio-economic status (SES) between the two groups (Diaz, 1988; Lambert & Tucker, 1972). SES is known to have a substantial impact on educational outcomes on monolingual children (Alexander et al., 2007; Feitelson & Goldstein, 1986; Heath, 1982; Park, 2008; Sénéchal & LeFevre, 2002). Disparities in SES modulate the performance of bilinguals relative to monolinguals, as well (Cummins, 1979). Another motivation of this study, therefore, is to evaluate how socio-economic status (SES) interacts with written language development. Specifically, which differences between the two linguistics groups seem to be driven primarily by disparities in SES?
Hypotheses

This study seeks to explore the profile of written expression in bilingual children to further our understanding of the areas of greatest need of intervention as well as the relationship between reading and writing in bilinguals.

1. Linguistic Status Hypothesis: based on the differences in reading comprehension, oral comprehension, and vocabulary between the monolingual and bilingual groups discussed in Chapters 1 and 2, clear differences in their written expression are also expected. Specifically, bilingual children are predicted to have lower complexity and accuracy in their writing. Given bilingual children’s strong decoding abilities, however, proportion of spelling errors may be comparable to the monolingual group, as decoding and spelling are highly correlated.

2. Socio-economic Hypothesis: Given that differences in oral and reading comprehension between the monolingual and bilingual children resolved when controlling for SES, a similar outcome is expected in their writing. Specifically, writing differences seen in the full cohort will resolve when controlling for SES.

Method

As part of a larger study, 125 monolingual and 137 bilingual children were recruited from 7 low-SES schools (> 50% of students qualifying for free or reduced-price lunch) in two school districts in southern California. From 25-50% of students at those schools had limited English proficiency; of those, more than 75% had a home language of Spanish. Students were invited to participate either during an announcement made in class or during an after-school reading program. Parents of
students at most of the schools were asked to fill out demographic questionnaires adapted from Marian, Blumenfeld, and Kaushanskaya (2007), which were used to select children for the SES-match analysis. Students from two schools (n = 43) were not given the questionnaires. The questionnaires included questions regarding parental education level and number of books in the home, which were used for the SES-match analysis (described below).

Monolingual children had only English in the home per school records and parent and/or teacher report. Bilingual children had limited English proficiency based on performance on the California English Language Development Test (CELDT) and had a home language of Spanish per school records and parent and/or teacher report. Children were excluded from the study if they had a home language other than English or Spanish (n = 34) or a history of language or learning problems (n = 30). Data from 12 monolingual and 25 bilingual children were not included because they were outside of the range of interest (first through fourth grade); an additional 4 monolingual and 12 bilingual children were not available to be given the written narrative task. Narratives from 9 monolingual children were pseudo-randomly selected to be removed before analysis to provide equal numbers of children at each grade in both groups. In total, data from the written narrative task were available for 100 bilingual children and 100 monolingual children (see Table 1 for N and mean ages by linguistic status and grade).

As part of a larger English testing battery, children were shown a series of five pictures and told “Look at these pictures. These pictures go together to tell a story. I
want you to think about it and then write the story that goes with these pictures. Make your story as long and as complete as possible.” Children were encouraged to guess at spelling unfamiliar words and told to cross out mistakes. After finishing, the child was asked to read the narrative back to the experimenter. The readback was recorded digitally and used to clarify ambiguous spelling or handwriting. The child was allowed to make changes during the readback; such changes were noted by the experimenter on the child’s narrative when the child was done. Experimenters asked general questions (e.g., “All done?”) but did not comment on the specifics of a child’s story. If they asked for help, children were told to “Try your best.”

Table 4-1. N and mean age (with standard error) by linguistic status and grade. MA = Mean age. SE = Standard error. Mon = Monolingual. Bil = Bilingual.

<table>
<thead>
<tr>
<th></th>
<th>First</th>
<th></th>
<th>Second</th>
<th></th>
<th>Third</th>
<th></th>
<th>Fourth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>MA (SE)</td>
<td>N</td>
<td>MA (SE)</td>
<td>N</td>
<td>MA (SE)</td>
<td>N</td>
</tr>
<tr>
<td>Mon</td>
<td>31</td>
<td>6.89 (.06)</td>
<td>33</td>
<td>7.83 (.06)</td>
<td>18</td>
<td>8.69 (.06)</td>
<td>18</td>
</tr>
<tr>
<td>Bil</td>
<td>31</td>
<td>6.87 (.05)</td>
<td>33</td>
<td>7.99 (.06)</td>
<td>18</td>
<td>8.80 (.06)</td>
<td>18</td>
</tr>
</tbody>
</table>

Two different sets of color pictures from the Test of Narrative Language (Gillam & Pearson, 2004) were used. According to the testing manual, The Test of Narrative Language is appropriate for children age five to twelve and uses stimuli that are unbiased culturally. The specific stimuli come from the “Shipwreck” and “Late for School” tasks (tests 3 and 4, respectively). Both are sets of five drawings which show a sequence of events happening in chronological order to a child protagonist. In “Shipwreck,” a child’s school project (a wooden boat) is ruined on her way to school, and she decides to fix it as best she can. In “Late for School,” a child oversleeps and
endures a series of setbacks as he rushes to get to school. The number of monolingual and bilingual children that wrote about each story was counterbalanced.

**Transcription and Coding**

Narratives were transcribed and entered in a standard format using the Systematic Analysis of Language Transcript conventions (SALT; Miller & Iglesias, 2006). Transcribers consulted the child’s readback to clarify ambiguous or unintelligible letters. Words that remained unclear after consulting the readback were coded as unintelligible and excluded from analysis. Words that the child crossed out were also excluded from analysis. Misspellings and other errors were preserved in the transcripts (see Figure 4-1). Transcribers were blind to the linguistic status of the child when transcribing.

There was one guy whew woke up from bed. He was going to eat cereal. He poke his shoe lace on his leg. He was hedding up to the school bus and the school bus ridding away.

Figure 4-1. A transcription of a monolingual first grader’s narrative. Misspellings, crossed-out words and other errors are preserved from the original text.

Narratives were coded for variables in three general categories: productivity, complexity, and accuracy. Three productivity measures were

1. *Total number of words* (TNW).

2. *Number of different words* (NDW), an assessment of lexical diversity. To reduce the impact of text length, NDW was not counted for children who wrote less than 20 words (7 monolingual, 7 bilingual) or more than 99 words (5
monolingual, 4 bilingual). NDW was not analyzed in the by-grade analysis, due to expected differences in TNW as a confounder. Type-token ratio (NDW divided by TNW) is a commonly-used measure of lexical diversity that controls for length, and increases throughout the lifespan in written narratives (e.g., Berman & Verhoeven, 2002b). Nonetheless, it is flawed, particularly because it is confounded with length (Jarvis, 2002; Laufer & Nation, 1995; Malvern & Richards, 2002; Nelson et al., 2004; Vermeer, 2000). For extremely short texts, the ratio is close to 1; as length increases, so does the probability of repeating a word type. As such, the type-token ratio will not be used.

3. **Number of story grammar elements**, adapted from Reilly, Losh, Bellugi & Wulfeck (2004). One point was awarded for each of the following structural elements: setting (*the boy is in bed*), problem (*the boy is late*), response (*the boy rushes to get ready*), and explicit resolution (*the boy promises to not be late again*).

Three complexity measures were

1. **Proposition density**. The total number of words in each story was divided by the number of propositions. Propositions are similar to clauses, and are defined as a main verb and its arguments (e.g., Reilly, Bates, & Marchman, 1998). Given the challenge punctuation presents young writers, using number of propositions was deemed to be more reliable than number of sentences. Similar measures of clausal density have been used in other studies (Carlisle & Beeman, 2000; Hunt, 1965; Kroll, 1981; Loban, 1976; Mackie et al., in press).
2. **Proportion of literate language features (PLLF).** Narratives were analyzed for four categories of literate language features (Greenhalgh & Strong, 2001): adverbs (*The boy ran quickly to school*), conjunctions (*One day when my friend Sean went to bed...*), mental state verbs (*The teacher thought the boy was crazy*), and elaborated noun phrases. Elaborated noun phrases contribute to description of objects and characters in the narration and include adjectives (*he made a big mess*), prepositional phrases (*He dropped his project in a puddle*), and relative clauses (*there was a young boy who overslept*). Multiple literate language features within the same phrase were only counted once: *He fell into a muddy puddle* (1 feature). Literate language features appearing in separate phrases were counted individually: *A little boy that makes a boat* (2 features). Proportion of literate language feature use was calculated by dividing the total number of instances by the total number of propositions.

3. **Syntactic use score (SUS).** The syntactic use score was adapted from the rubric used in the Test of Narrative Language (Gillam & Pearson, 2004), based on two dimensions, each ranging from 0-2 points. The first was causality, which examined use of adverbial conjunctions to create direct relationships between two events (e.g., because, since, so). No points were awarded if no causal relationships were described. One point was awarded for one causal relationship; more than one causal relationship scored two points. The second dimension, temporality, examined the use of connectives to provide sequence. No points were awarded if no temporal relationships were stated. Children who
used “and” or “then” were awarded one point. Use of adverbial conjunctions such as “before” and “after” was awarded two points.

Five accuracy measures were

1. *Proportion of spelling errors.* A word was considered to be misspelled if it did not match standard American English spelling conventions, or if a correctly spelled word did not match the context (e.g., *The boy was to tired*). Words with letter reversals were counted as incorrect only if the letter reversal produced a different letter (e.g., b for d – *The doy* woke up).

2. *Proportion of phonologically plausible spelling errors* (PPPSE). This qualitative analysis of spelling errors was used to evaluate children’s knowledge of phonological encoding rules in English. Misspellings were rated as plausible or implausible through homophony or analogy (Silliman et al., 2006; Treiman & Kessler, 2004). A misspelling of “lase” for lace was judged plausible because “-ase” often is pronounced the same as “-ace” (as in “base”). Likewise, “wolk” was scored as plausible for woke because of the analogy to “yolk.” “Brook” is not a plausible substitute for broke because “brook” is not pronounced with the /o/ sound in broke. The 4 monolingual and 5 bilingual children who made no spelling errors were not given scores for PPPSE but their data was used in the analyses of other productivity, complexity and accuracy measures.
3. *Proportion of lexical errors.* Lexical errors (also called word choice errors) were inappropriate word choices based on sentence context and the picture referent (e.g., *The boy was tying his shoes and broke his rope*). This study appears to be the first to examine this feature in the narratives of bilingual children, although lexical errors have been evaluated in the adult bilingual literature (e.g., Ellis & Yuan, 2004; Engber, 1995; Lyster, 2001). To examine the possibility that the bilingual children’s lexical errors were due to relying on the Spanish forms of words, lexical errors were compared to the Spanish translations of the words. No evidence was found that interference from Spanish was impacting the bilingual children’s word selection.

4. *Proportion of morphological errors.* Bilingual children often struggle with verb tense marking and verb agreement (Paradis, 2005), so this aspect of morphology was focused on. Errors of verb tense (*Yesterday, he wakes up*) or verb agreement (*She walk*) were tallied and divided by the number of propositions to yield the proportion of morphological errors.

5. *Proportion of pronoun errors.* Pronoun errors were tallied as a gauge of referential cohesion (e.g., Chafe, 1976), a sensitive measure of writing quality (Bartlett, 1984; Rentel & King, 1983). Typically, character introduction, maintenance, and re-introduction are used as indices of cohesion (e.g., Wigglesworth, 1990). However, the stories contain a limited number of characters and in pilot testing children relied primarily on pronominal reference chains (that is, establishing a character and then referring back to
them through pronouns) in their narratives. Thus, we analyzed pronoun errors in children’s writing. Instances of referent-less pronominal phrases (*He was making a boat* as the first sentence of a narrative) or lack of pronoun agreement (e.g., *The boy leaves the house. She steps in a puddle*) were tallied and divided by the number of propositions in the narrative to yield the proportion of pronoun errors.

The coder was blind to the linguistic status of the child when coding the narratives. Examples of coded transcripts are shown in Figures 4-2 and 4-3.

```
1) The mom is building a boat for a * art project for his * son's school
2) *finally* he leaves for school
3) there is * a lot of puddles
4) he trips over *one* rock (problem)
5) and his boat is *all* messed up (problem)
6) he ends up ine * school
7) his teacher sees the boat *all* messed *
8) he might have to redo it *again*. (resolution)
```

Figure 4-2. A coded transcript from a bilingual fourth grade student. Numbered lines show individual propositions. Literate language features are in italics. Errors are marked by an asterisk (Line 1: spelling, pronoun; Line 3: morphological; Line 6: spelling; Line 7: lexical – omitted word). productivity: TNW = 56; NDW = 37; Story grammar score: 2 out of 4 (problem and resolution). complexity: Proposition Density: 56/8 = 7; PLLF: 8/8 = 1.0; Syntactic use score = 2 (2 for temporality, “finally”; 0 for causality). accuracy: Proportion of spelling errors: 2/56 = 0.04; PPPSE: 0/2 = 2; proportion of lexical errors: 1/8 = 0.25; proportion of morphological errors: 1/8 = .125; proportion of pronoun errors: 1/8 = 0.25.
Analyses

The data presented here are non-orthogonal. As such, separate ANOVAs were run to examine differences between linguistic groups and grades. While developmental differences are not a primary concern of this study, they nonetheless serve to contextualize the differences between the two linguistic groups: significant effects of grade on a measure suggest the measure is sensitive to changes in writing development, and thus to differences in writing. As described above, dependent measures fall into one of three categories: 1) productivity measures were number of words, number of different words, and number of story grammar elements; 2) complexity measures were proposition density (number of words per proposition),
proportion of literate language features, and syntactic use score; and accuracy measures were proportion of spelling errors, proportion of phonologically plausible spelling errors, and proportion of lexical, morphological and pronoun errors.

Proportion data violate the assumptions of analyses of variance (e.g., Jaeger, 2008). Thus, values from the seven proportion-based measures were transformed (proposition density, proportion of literate language features, and all the accuracy measures). In narrative research, an arcsine transformation (also called an angular transformation) is often used (Colozzo, Gillam, Wood, Schnell, & Johnston, 2011; Kaderavek & Sulzby, 2000; Kennedy & Nawrocki, 2003). However, this transformation has limited applicability at the extremes of the proportion scale (i.e., near 0 and 1; Studebaker, 1985). Since the proportions of errors contained many 0 values, a logit transformation was deemed more appropriate (Johnson & Anglin, 1995).

A logit transformation takes the natural log of a value divided by 1 minus that value. In order to avoid the problem of 0 values resulting in an undefined value (i.e., negative infinity) after the transformation, the method described by Warton and Hui (2010) was used, whereby the smallest non-zero value in the dataset was added in to the numerator and denominator of the equation before the natural log was calculated. Statistics were calculated on transformed values of the seven proportion-based measures; untransformed means are reported for ease of interpretability (e.g., Kaderavek & Sulzby, 2000).
A subset analysis was also conducted to examine how SES mediates performance in the two different linguistic groups (i.e., monolingual or bilingual). Of the 61 monolingual children and 42 bilingual children with full demographic and narrative data available, 36 monolingual and 36 bilingual children contributed data to the SES-match analysis. Data from these children were analyzed using an ANOVA on the written narrative measures.

**Results**

Before discussing the results of the grade and linguistic analyses, some descriptive statistics of the writing samples are pertinent. Narratives ranged in length from 8 to 174 words (2 to 38 propositions), with a mean length of 47.9 words (9.1 propositions). Across all writing samples, spelling errors were the most common, with an average of approximately 6 per sample. Only 9 out of 200 children (4.5%) made no spelling errors. Pronoun errors were the least common, with an average of 0.3 per sample. There were 150 children (75%) who made no pronoun errors. One possible explanation is that children who wrote longer stories had more opportunities to make an error, and the children who did not make errors simply wrote shorter stories overall. Inspection of the mean number of words written reveals the opposite is the case: children who made one or more pronoun error wrote 38 words on average, whereas children who made no pronoun errors wrote a mean of 51 words in their stories.
Effects of Grade

As mentioned previously, the grade analysis is presented primarily to help contextualize the linguistic analysis. Means and standard errors by grade are reported in Tables 4-2 and 4-3. Significant effects for grade were found on the productivity measures: TNW \((F(3,196) = 14.67, p < .001)\), story grammar score \((F(3,196) = 6.67, p < .001)\); two of the complexity measures: PLLF \((F(3,196) = 20.05, p < .001)\), SUS

Table 4-2. Means and standard errors (SE) for the productivity and complexity Measures by grade. TNW = total number of words; Story Gram = number of story grammar elements; Prop Density = proposition density; PLLF = proportion of literate language features; SUS = syntactic use score.  \(b = p < .001\).

<table>
<thead>
<tr>
<th>Grade</th>
<th>TNW(^b) Mean (SE)</th>
<th>Story Gram(^b) Mean (SE)</th>
<th>Prop Density Mean (SE)</th>
<th>PLLF(^b) Mean (SE)</th>
<th>SUS(^b) Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>31.98 (1.97)</td>
<td>1.39 (0.11)</td>
<td>5.02 (0.13)</td>
<td>0.24 (0.03)</td>
<td>3.39 (0.23)</td>
</tr>
<tr>
<td>2</td>
<td>52.05 (2.84)</td>
<td>1.94 (0.11)</td>
<td>5.29 (0.10)</td>
<td>0.39 (0.03)</td>
<td>4.42 (0.22)</td>
</tr>
<tr>
<td>3</td>
<td>53.14 (4.27)</td>
<td>1.75 (0.13)</td>
<td>5.34 (0.12)</td>
<td>0.57 (0.05)</td>
<td>4.47 (0.29)</td>
</tr>
<tr>
<td>4</td>
<td>62.44 (5.65)</td>
<td>2.11 (0.15)</td>
<td>5.35 (0.12)</td>
<td>0.59 (0.04)</td>
<td>5.06 (0.30)</td>
</tr>
</tbody>
</table>

Table 4-3. Means and standard errors (SE) for the accuracy Measures by grade. Spelling Err = proportion of spelling errors; PPPSE = proportion of phonologically plausible spelling errors; Lexical Err = proportion of lexical errors; Morph Err = proportion of morphological errors; Pronoun Err = proportion of pronoun errors.  \(b = p < .001\).

<table>
<thead>
<tr>
<th>Grade</th>
<th>Spelling Err(^b) Mean (SE)</th>
<th>PPPSE Mean (SE)</th>
<th>Lexical Err Mean (SE)</th>
<th>Morph Err Mean (SE)</th>
<th>Pronoun Err Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.32 (0.03)</td>
<td>0.28 (.03)</td>
<td>0.11 (0.02)</td>
<td>0.20 (0.03)</td>
<td>0.07 (0.01)</td>
</tr>
<tr>
<td>2</td>
<td>0.12 (0.01)</td>
<td>0.41 (.04)</td>
<td>0.07 (0.01)</td>
<td>0.14 (0.02)</td>
<td>0.03 (0.01)</td>
</tr>
<tr>
<td>3</td>
<td>0.10 (0.02)</td>
<td>0.45 (.06)</td>
<td>0.08 (0.02)</td>
<td>0.15 (0.03)</td>
<td>0.04 (0.01)</td>
</tr>
<tr>
<td>4</td>
<td>0.09 (0.02)</td>
<td>0.41 (.06)</td>
<td>0.07 (0.02)</td>
<td>0.08 (0.02)</td>
<td>0.04 (0.01)</td>
</tr>
</tbody>
</table>
[F (3,196) = 5.84, \( p = .001 \)]; and one accuracy measure: proportion of spelling errors [F (3,196) = 29.23, \( p < .001 \)]. In all cases, these effects were driven by better performance in the older children relative to the younger children. There were no effects of grade on proposition density, PPPSE, or proportion of morphological, pronoun, and lexical errors. As mentioned above, NDW was not included in this analysis due to the expected confounding with TNW.

**Effects of Linguistic Status**

Bilingual children were comparable to monolingual children on all of the productivity and complexity measures (Table 4-4). There was a non-significant trend

<table>
<thead>
<tr>
<th>Group</th>
<th>TNW</th>
<th>NDW</th>
<th>Story Gram</th>
<th>Prop Density</th>
<th>PLLF</th>
<th>SUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SE)</td>
<td>Mean (SE)</td>
<td>Mean (SE)</td>
<td>Mean (SE)</td>
<td>Mean (SE)</td>
<td>Mean (SE)</td>
</tr>
<tr>
<td>Mon</td>
<td>50.17 (2.90)</td>
<td>32.38 (1.51)</td>
<td>1.82 (0.09)</td>
<td>5.19 (0.09)</td>
<td>0.43 (0.03)</td>
<td>1.69 (0.13)</td>
</tr>
<tr>
<td>Bil</td>
<td>45.62 (2.33)</td>
<td>28.86 (1.26)</td>
<td>1.71 (0.09)</td>
<td>5.26 (0.08)</td>
<td>0.40 (0.03)</td>
<td>1.55 (0.12)</td>
</tr>
</tbody>
</table>

for a difference in NDW [32.38 vs. 28.86, F (1,198) = 3.21, \( p = .075 \)]. Significant differences were found on the accuracy measures (Table 4-5) on PPPSE [0.45 vs. 0.30, F (1,189) = 9.81, \( p = .002 \)] and proportion of lexical [0.05 vs. 0.12, F (1,198) = 12.86, \( p < .001 \)] and morphological errors [0.11 vs. 0.19, F (1,198) = 5.83, \( p = .017 \)]. Note that higher PPPSE scores and lower proportions of errors indicated better performance, and that in each case the monolingual children had better performance
than the bilingual children. Examples of the spelling errors are shown in Table 4-6 and morphological errors are shown in Table 4-7.

Table 4-5. Means and standard errors (SE) for the accuracy measures by group. Mon = Monolingual; Bil = Bilingual. Spelling Err = proportion of spelling errors; PPPSE = proportion of phonologically plausible spelling errors; Lexical Err = proportion of lexical errors; Morph Err = proportion of morphological errors; Pronoun Err = proportion of pronoun errors. a = p < .05; b = p < .01. c = p < .001.

<table>
<thead>
<tr>
<th>Group</th>
<th>Spelling Err Mean (SE)</th>
<th>PPPSE Mean (SE)</th>
<th>Lexical Err Mean (SE)</th>
<th>Morph Err Mean (SE)</th>
<th>Pronoun Err Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon</td>
<td>0.15 (0.02)</td>
<td>0.45 (0.03)</td>
<td>0.05 (0.01)</td>
<td>0.11 (0.02)</td>
<td>0.04 (0.01)</td>
</tr>
<tr>
<td>Bil</td>
<td>0.19 (0.02)</td>
<td>0.30 (0.03)</td>
<td>0.12 (0.02)</td>
<td>0.19 (0.02)</td>
<td>0.05 (0.01)</td>
</tr>
</tbody>
</table>

Table 4-6. Examples of spelling errors. Plaus Sp = Phonologically Plausible Spelling Error; Implaus Sp = Phonologically Implausible Spelling Error. Mon = Monolingual; Bil = Bilingual. Numbers represent the children’s grade.

<table>
<thead>
<tr>
<th>Group</th>
<th>Plaus Sp</th>
<th>Implaus Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon 1</td>
<td>pance (pants)</td>
<td>stuke (stuck)</td>
</tr>
<tr>
<td>Mon 2</td>
<td>scool (school)</td>
<td>afler (after)</td>
</tr>
<tr>
<td>Mon 3</td>
<td>ruind (ruined)</td>
<td>finllay (finally)</td>
</tr>
<tr>
<td>Mon 4</td>
<td>wolk (woke)</td>
<td>hofley (hopefully)</td>
</tr>
<tr>
<td>Bil 1</td>
<td>spils (spills)</td>
<td>bre (dirty)</td>
</tr>
<tr>
<td>Bil 2</td>
<td>himselff (himself)</td>
<td>gops (drops)</td>
</tr>
<tr>
<td>Bil 3</td>
<td>bilding (building)</td>
<td>bocein (broken)</td>
</tr>
<tr>
<td>Bil 4</td>
<td>distroid (destroyed)</td>
<td>triped (tripped)</td>
</tr>
</tbody>
</table>
Table 4-7. Examples of morphological errors. Mon = Monolingual; Bil = Bilingual. Numbers represent the children’s grade.

<table>
<thead>
<tr>
<th>ID</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon 1</td>
<td>The mom help.</td>
</tr>
<tr>
<td>Mon 2</td>
<td>She buyed him a new boat.</td>
</tr>
<tr>
<td>Mon 3</td>
<td>He ate breakfast his shoe snap...</td>
</tr>
<tr>
<td>Mon 4</td>
<td>He wanted to make a boat so he can show it...</td>
</tr>
<tr>
<td>Bil 1</td>
<td>The boy rip the boat.</td>
</tr>
<tr>
<td>Bil 2</td>
<td>He drop the milk.</td>
</tr>
<tr>
<td>Bil 3</td>
<td>He gotted to go walking to school.</td>
</tr>
<tr>
<td>Bil 4</td>
<td>He went to the bus stop and miss the bus...</td>
</tr>
</tbody>
</table>

The SES-match Analysis

The SES-match analysis used a subset of 36 monolingual (9 first, 8 second, 12 third and 7 fourth grade) and 36 bilingual (8 first, 9 second, 12 third and 7 fourth grade) children matched for age, parental education and number of books in the home. As with the group analyses above, there were no significant effects of group on the productivity or complexity measures (Table 4-8). Effects of group were found on the accuracy measures (Table 4-9). Linguistic status had a significant effect on PPPSE [F (1,67) = 4.88, p = .031]. The PPPSE analysis did not include 2 monolingual children and 1 bilingual child who made no spelling errors. The monolingual group outperformed the bilingual group in PPPSE, as with the previous analysis. There was also a trend towards a group effect on proportion of pronoun errors [F (1,70) = 3.91, p = .052]. The trend on pronoun errors was driven by better performance (i.e., less errors) in the bilingual group rather than the monolingual group; in addition, a greater
number of monolingual children making pronoun errors than bilingual children (9 vs. 2). It is possible that this trend would have reached significance in a larger sample.

Table 4-8. Means and standard errors (SE) for the productivity and complexity measures by group after controlling for SES. Mon = Monolingual; Bil = Bilingual. TNW = total number of words; NDW = number of different words; Story Gram = number of story grammar elements; Prop Density = proposition density; PLLF = proportion of literate language features; SUS = syntactic use score. There were no significant differences on any measure.

<table>
<thead>
<tr>
<th>Group</th>
<th>TNW Mean (SE)</th>
<th>NDW Mean (SE)</th>
<th>Story Gram Mean (SE)</th>
<th>Prop Density Mean (SE)</th>
<th>PLLF Mean (SE)</th>
<th>SUS Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon</td>
<td>50.56 (4.69)</td>
<td>30.71 (1.53)</td>
<td>1.53 (.12)</td>
<td>5.39 (.13)</td>
<td>0.46 (.04)</td>
<td>1.69 (.19)</td>
</tr>
<tr>
<td>Bil</td>
<td>50.56 (4.49)</td>
<td>31.38 (1.50)</td>
<td>1.75 (.16)</td>
<td>5.44 (.13)</td>
<td>0.56 (.05)</td>
<td>1.86 (.19)</td>
</tr>
</tbody>
</table>

Table 4-9. Means and standard errors (SE) for the accuracy measures by group after controlling for SES. Mon = Monolingual; Bil = Bilingual. TNW = total number of words; NDW = number of different words; Story Gram = number of story grammar elements; Prop Density = proposition density; PLLF = proportion of literate language features; SUS = syntactic use score. a = p = .052; b = p < .05.

<table>
<thead>
<tr>
<th>Group</th>
<th>Spelling Err Mean (SE)</th>
<th>PPPSE&lt;sup&gt;b&lt;/sup&gt; Mean (SE)</th>
<th>Lexical Err Mean (SE)</th>
<th>Morph Err Mean (SE)</th>
<th>Pronoun Err&lt;sup&gt;a&lt;/sup&gt; Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon</td>
<td>0.12 (.02)</td>
<td>0.44 (.06)</td>
<td>0.07 (.02)</td>
<td>0.14 (.03)</td>
<td>0.03 (.01)</td>
</tr>
<tr>
<td>Bil</td>
<td>0.16 (.03)</td>
<td>0.27 (.04)</td>
<td>0.11 (.03)</td>
<td>0.10 (.03)</td>
<td>0.02 (.01)</td>
</tr>
</tbody>
</table>

**Discussion**

The primary goal of this study was to examine the early writing ability of the bilingual group relative to the monolingual group. The comparison between the two linguistic groups is intended to reveal differences in the writing of monolingual and bilingual children who attend the same schools. In addition, this study provides a
preliminary picture how demographic factors interact with the written narrative measures. Hypotheses were lower complexity and accuracy in the bilingual group relative to monolinguals and that these differences would not be present when controlling for disparities in socio-economic status.

**The Effects of Linguistic Status on Writing Ability**

Before controlling for SES, no differences were found between the two groups in terms of productivity or complexity measures (save for a non-significant trend in NDW which will not be discussed further). The only effects of linguistic status were found on the accuracy measures. Monolingual children wrote narratives that had higher rates of phonologically-plausible spelling errors and lower proportions of lexical and morphological errors than bilingual children.

Bilingual children have been found to perform below monolingual children on standardized spelling tests (e.g., Oller et al., 2007). The present study did not find differences between these two groups in terms of number of spelling errors made, but rather the type of spelling errors made. The difference on PPPSE suggests that bilingual children are less familiar with the rules governing English orthography (e.g., Venezky, 1970). The data indicate the importance of spelling interventions for the bilingual children that focus on English orthographic rules, given that the bilingual children may have an advantage over monolingual children in phonological awareness (e.g., Bialystok, Luk, & Kwan, 2005), a component of skilled spelling (Ehri, 2000).

Given the studies indicating vocabulary (August et al., 2005; Oller & Eilers, 2002; Pearson, Fernandez, & Oller, 1993; Umbel, Pearson, Fernández, & Oller, 1992)
and verb marking (McClure & Platt, 1988; Paradis, 2005) are vulnerable areas in the spoken domain for bilingual children, the differences in lexical and morphological error rate are not surprising. This appears to be the first study to examine lexical errors in the bilingual group. Note that McClure and Platt (1988) highlighted verb marking as a particularly challenging area for bilingual children. In our study, the bilingual children made approximately twice as many morphological errors as monolingual children, but two and half times as many lexical errors as monolingual children. In other words, the bilingual children in the present study seemed to have more difficulty generating the appropriate lexical item to match the sentence context than using correct verb marking. The higher frequency of lexical errors in the bilingual group fits with the research showing a less robust monolingual vocabulary; their problems with the lexicon will likely be more of an issue in later grades when they are expected to use more advanced writing styles (Olinghouse & Leaird, 2009; Olinghouse & Wilson, in press).

More interesting than the positive findings is the lack of differences found on the productivity (TNW, NDW, story grammar) and complexity (propo

the majority of the measures used in the study. The ramifications of these null results are discussed in the following paragraphs.

The productivity measures may have been constrained by the stimuli used. Children might have used more varied vocabulary had they been writing spontaneously about a biographical event rather than based on specific pictures, increasing variability on the NDW measure. In addition, such a paradigm might afford the opportunity for multiple nested story episodes (e.g., Munoz, Gillam, Pena, & Gulley-Faehnle, 2003), thereby increasing variability on the story grammar measure. Note that the story grammar score was sensitive to effects of grade. Another possibility is that bilingual’s knowledge of story structure transferred from Spanish, as narratives are considered culturally universal (Berman & Slobin, 1994). This hypothesis could be tested further by comparing story grammar in Spanish and English narratives of the bilingual children.

The complexity measures may not have been able to discriminate differences between the children at this age. Proposition density appears to develop the most in high school (Loban, 1976); effects of linguistic status on this measure may only be found in older children. There were no significant differences between the two groups in proportion of literate language features used. In a previous study of children's spoken narratives, two categories of literate language features were found to discriminate 7-10 year-old children with and without language impairment (Greenhalgh & Strong, 2001): proportion of conjunctions and of elaborated noun phrases. Given the relatively low numbers of literate language features in the written
narratives, further sub-dividing into the categories used by Greenhalgh and Strong was deemed inappropriate. It is possible that a significant effect of linguistic group would be found in certain categories of literate language features if sub-categorization were feasible. Nonetheless, it is noteworthy that in our large sample, bilingual children used as many literate language features as monolingual children - especially as literate language feature use in spoken language has been tied to literacy development. Many of the literate language features are types of complex syntax (e.g., conjunctions, elaborated noun phrases, adverbs). A bilingual advantage for Spanish-English bilingual children has been found for syntactic awareness (as measured by grammatically judgment; Galambos & Goldin-Meadow, 1990), which may carry over to complex syntax use in writing. Enhanced syntactic awareness could also explain the lack of difference on the syntactic use score.

The lack of an effect of linguistic status on proportion of pronoun errors may have been due to the low overall error rates on this measure. There were few characters in the narrative stimuli (two in the “Late for School” story and three in the “Shipwreck” story). Pictures that had more characters, particularly of the same gender, would have created more opportunities for pronoun use, and thus, pronoun errors. Using stimuli with more characters would also serve to clarify the trend towards a bilingual advantage in pronoun use (discussed below).

The Effect of Socio-Economic Status on Writing Ability

Socio-economic status is a powerful mediator of performance in reading and writing (Alexander et al., 2007; August & Shanahan, 2006; Loban, 1976). Loban’s
(1976) longitudinal study of children from first to twelfth grade indicated that SES impacts clausal density and complex syntax use (elaboration) throughout schooling (it bears mentioning that the study contains no formal statistical analysis). The complexity measures in the present study (proposition density, PLLF, and SUS) are most analogous to Loban’s elaboration measures and thus seem most likely to reflect the impact of SES. However, the results for the complexity measures did not change when controlling for SES.

Note that the SES-match analysis involves a reduction in sample size and corresponding reduction in power. Therefore, caution must be used in interpreting the results. Differences between the linguistic groups on proportion of morphological and lexical errors were not present when controlling for SES. A significant effect of linguistic status was found on one of the accuracy measures: the monolinguals outperformed the bilinguals in proportion of phonologically plausible spelling errors, as before. In addition, there was a trend for a bilingual advantage in pronoun use, such that the bilingual children had lower rates of pronoun errors than the monolinguals. The result missed significance, and may be a cohort effect or other statistical artifact. Nonetheless, a bilingual advantage in correct pronoun use would be parsimonious with other research finding a bilingual advantage in grammaticality judgment for Spanish-English bilinguals (Galambos & Goldin-Meadow, 1990). Exposure to a language like Spanish, which allows omission of subject pronouns, and uses grammatical gender, may increase bilingual children’s attention to pronouns.
Conclusions

The present study evaluated the writing ability of the bilingual children relative to monolingual children. The primary linguistic differences in the full cohort were on accuracy measures. The results underscore the importance of increased vocabulary for the bilingual children (cf. August et al., 2005). However, the only difference to persist when controlling for differences in home SES was in phonological plausibility of spelling errors, indicating bilingual children need further support in English orthographic rules. In addition, the possibility of a bilingual advantage in pronoun use for bilingual children coming from higher-SES backgrounds needs to be explored directly, particularly in a task that requires writing about a greater number of characters and thus, presents more opportunities to make pronoun errors. Further studies are necessary to evaluate the relationships of spoken and written language in the bilingual children (e.g., Berman & Verhoeven, 2002a) in English, as well as the cross-linguistic influence of Spanish and English on the bilingual children’s writing.
Chapter 5

Discussion and Conclusions
Overview

Reading is a highly valuable skill, particularly in industrialized countries like the U.S., where it is an important factor for academic and career success. Spanish-English bilingual (SEB) children are a growing proportion of students in U.S. schools but have significant difficulties with reading comprehension. The studies in this dissertation, therefore, were designed to gauge their literacy abilities. From a practical perspective, this research can inform educational policy for reading among SEB children, as well as help clinicians identify the typical literacy profile in this group. Uncovering this profile is of great diagnostic utility for appropriately diagnosing language and learning disabilities in the SEB group.

The children in this study exhibit a specific subtype of bilingualism, receiving instruction in their schools almost exclusively in English while hearing Spanish (or a mix of Spanish and English) in the home. This type of bilingualism is often referred to as sequential bilingualism, which contrasts with simultaneous bilingualism – where both languages are learned from birth (e.g., Castilla, Restrepo, & Perez-Leroux, 2009; Davison, 2009). There are compelling reasons to believe that sequential and simultaneous bilingualism will lead to different reading performance profiles (Castilla et al., 2009; Cummins, 1979; Genesee & Jared, 2008; Lambert & Tucker, 1972). In addition to the practical rationale described above, the studies in this dissertation were designed to increase our theoretical knowledge of reading in sequential bilinguals. Specifically, the data address the socio-economic profile of sequential bilinguals.
relative to their monolingual English (ME) classmates and how those socio-economic differences interact with the SEB children’s linguistic background.

The three studies in Chapters 2-4 evaluated the literacy abilities of first through fourth grade students from the same classes in southern California schools. Children were split into two groups based on linguistic status: ME and SEB. Recruiting children from the same classrooms controlled for variability introduced by school and teacher differences.

The three broad research questions introduced in Chapter 1 were:

- How do demographic factors impact language and literacy in SEB children?
- What impact do intra- and inter-linguistic factors have on SEB children’s ability to assign meaning to text?
- How do SEB children compare to ME children in terms of written expression?

This chapter summarizes the studies, their results, and how the results address these questions. Future research directions are also discussed.

**Demographic and Linguistic Factors of Literacy**

The first study (Chapter 2) indexed the performance of the ME and SEB groups on a battery of tasks related to reading. The goals of the study were to evaluate how the reading profile of SEB children differs across age groups and how socio-economic status (SES) interacts with component reading skills. The battery included the reading comprehension, decoding, vocabulary, and oral comprehension sub-tests from the Woodcock-Johnson Tests of Achievement and an experimental fluency task. A questionnaire was also given to the parents of the children that asked questions
about the children’s linguistic background, their home literacy environment and the education level of the parents. The data were analyzed for effects of grade, linguistic group, and an interaction between the two. Additionally, a subset analysis was conducted to evaluate how differences between the linguistic groups changed when controlling for SES.

SEB children were found to significantly differ from ME children on both demographic measures and linguistic measures. On the questionnaires, ME children’s parents reported higher numbers of books in the home, a greater frequency of reading to their child, and achieving a higher education level than the parents of SEB children. Note that these effects of linguistic group on demographic factors were robust despite the fact that the ME and SEB children attended the same schools. The SEB children scored significantly below the ME children on oral and reading comprehension, vocabulary, fluency, and fluency accuracy. No effect of linguistic status was found on decoding.

A specific focus of Chapter 2 was whether SEB children appear to catch up or fall behind ME children in reading comprehension and component skills that support it. Interactions of grade and language background can address this question: non-significant interactions suggest that differences are stable at each grade level, whereas significant interactions indicate a change with age. The data were cross-sectional; nonetheless, clear effects of grade were found on all the tasks in the reading battery. These effects provide some reassurance that any interactions seen are not due to cohort effects, as the performance of the children in the different grades fits the expected
developmental profile of better skill in the older children relative to the younger children.

The only significant interaction found was on the fluency measures. First-grade SEB children were slower and less accurate than their ME peers; no differences were seen in the second through fourth grade children. This interaction suggests that SEB children are catching up to ME children in real word decoding ability, although ceiling effects on the fluency task may be masking continuing differences. Since the ME children had significantly better reading comprehension than the SEB children and there was no interaction of grade by linguistic status on this measure, suggesting the difference is stable across the different age groups. Thus, SEB children appear to start, rather than fall, behind their ME peers in terms of reading ability (e.g., Brice & Brice, 2009; Hammer, 2007; "Head Start FACES 2000," 2003).

The other primary research question was how SES interacted with linguistic status in the ME and SEB children. Overall, there was strong evidence that SES drives many of the differences between the SEB children relative to their ME classmates on the linguistic measures. As discussed above, significant differences were found for the demographic variables from the questionnaire. When controlling for these differences, the ME children only outperformed the SEB children on the vocabulary measure. More intriguing was the finding that SEB children had significantly better non-word decoding than ME children when controlling for differences in SES. This result is discussed further below, after the summaries of the other two studies.
The Role of Vocabulary in Bilingual Reading

The second study (Chapter 3) examined the cognitive processes that underpin reading in the two groups. This study evaluated the practical ways in which lexical processing is impacted by the less robust English vocabulary and second lexical system of the bilingual children. It also evaluated cross-linguistic lexical activation in early readers with no formalized, integrated bilingual instruction (in contrast to the children in Brenders et al., 2011).

A touch-screen task was administered in which children were shown a picture and asked to touch one of four words that matched the picture. In addition to a baseline condition, there were three experimental conditions. In the cognate condition, the target word shared form and meaning across languages. In the false cognate condition, one of the distracter words was highly similar in form to the Spanish translation of the target. In the phonological condition, the three distracter words were similar in form to the target. Outcome measures were accuracy and reaction time.

In this study, the data were analyzed for group effects of grade and linguistic status, and for a grade by linguistic status interaction. In terms of accuracy, no significant differences were found between the different grades or the different linguistic groups. This null result was likely due to the high frequency nature of the stimuli selected for the reading vocabulary task, as there were ceiling effects on the means for linguistic status as well as for grade (accuracy was one of the only measures across all three studies where no effect of grade was seen).
The younger children responded significantly slower than the older children in all four conditions. The SEB children had significantly slower performance in the cognate and false cognate conditions relative to baseline. An interaction effect was also found: fourth-grade ME children were significantly slower in the phonological condition relative to baseline, whereas all other children showed no effect in the phonological condition.

The interaction was interpreted to reflect more automated word processing in the older ME children, indicating a more mature reading system (e.g., Posnansky & Rayner, 1977). The lack of a similar effect for fourth-grade SEB children suggests that they are losing ground relative to the ME children. This finding stands out in contrast to the results from the Demographic and Linguistic Factors of Literacy study in Chapter 2, where the only significant interaction suggested SEB children were gaining ground on real word decoding.

Returning to the study questions, the SEB children demonstrated cross-linguistic lexical activation effects in a reading paradigm despite being early readers with minimal formalized bilingual instruction. This study appears to be the first to find evidence of activation of both of a bilingual’s languages for early readers.

**Written Expression in Early Readers**

The third study (Chapter 4) used a narrative paradigm to analyze the written expression of the children. The children’s writing abilities were analyzed on three dimensions: productivity, complexity and accuracy. The study served three roles: identifying the profile of early writing in the SEB children; evaluating the impact of
SES on their writing; and exploring how the SEB children’s writing abilities contrasted with their reading abilities. Data were analyzed for main effects of grade and linguistic group. As with the Demographic and Linguistic Factors of Literacy study (Chapter 2), a subset analysis was conducted to control for differences in SES.

Effects of linguistic status were found on three accuracy measures: proportion of phonologically plausible spelling errors, proportion of lexical errors, and proportion of morphological errors. Only the difference in proportion of phonologically plausible spelling errors persisted after controlling for differences in SES. In addition, the SES-analysis revealed a group effect on proportion of pronoun errors, with SEB children performing better (i.e., making errors less frequently) than ME children.

The written narrative data reinforced the findings from the study of the Demographic and Linguistic Factors of Reading in Chapter 2 in three ways. First, it underscored how significant an issue vocabulary is for SEB children, given that they had more trouble with lexical errors than they did with morphological errors. Second, it supported the notion that differences in SES drive many of the differences between the two linguistic groups, since the ME children did not exceed the SEB children on any measure in the SES-match analysis. Finally, there was a trend for a bilingual advantage when controlling for SES, this time for proportion of pronoun errors. These findings are discussed further in the next section.

The Literacy Profile of Bilingual Children

Taken together, the three studies presented in this dissertation offer a thorough examination of the literacy profile of elementary school SEB children. This section
evaluates the phonological and non-phonological linguistic abilities (e.g., vocabulary, oral comprehension) in the bilingual group as they relate to both reading and writing. Both factors have been revealed to impact reading comprehension (Gough & Tunmer, 1986) and are important for written expression (Abbott et al., 2010; Berninger et al., 2002).

The relationship of phonology to early reading and writing is complex. Decoding (word reading) and encoding (spelling) both have direct effects on literacy: decoding is a first step towards comprehension in reading (e.g., Gough & Juel, 1991) and encoding is a crucial aspect of writing (e.g., Berninger & Swanson, 1994). In addition, both decoding and encoding are demanding of cognitive resources in the early stages of literacy acquisition. Inexperienced readers have to focus so much attention on decoding that keeping track of previously presented information becomes difficult, impacting comprehension indirectly (Daneman & Carpenter, 1980; Goff, Pratt, & Ong, 2005). Likewise, recalling how to spell a word makes it harder to focus on idea generation and continuity in written expression (Abbott et al., 2010; Berninger & Swanson, 1994).

The phonological abilities evaluated in this dissertation were non-word decoding, fluency (timed decoding of real words), proportion of spelling errors, and proportion of phonologically plausible spelling errors (phonological plausibility). Previous studies using standardized tests have revealed a lexical effect in SEB children’s phonological abilities, such that real-word decoding and spelling were significantly below ME children, but not non-word decoding (Oller et al., 2007). As
with that study, SEB children fared just as well as ME children in non-word decoding but showed a difference in fluency, which requires real-word decoding. However, overall spelling error rates in the written narratives were comparable between the two groups, contrary to what would be expected from both the Oller and Eilers (2007) study and the difference in reading fluency (e.g., Ehri, 2000). Instead, the phonological plausibility of the spelling errors was what distinguished the SEB children from the ME children.

These results appear contradictory. Non-word decoding is a skill that requires knowledge of English orthographic rules; children cannot rely on rote memory to decode words they have never encountered before. Similarly, the phonological plausibility measure assesses how well children apply English orthographic rules to their spelling. One possible explanation is that phonological processing in the SEB children is different than in ME children because of the influence of Spanish (Ferroli & Shanahan, 1992; Leafstedt & Gerber, 2005), although Spanish influence is less prevalent in children familiar with English spelling conventions (e.g., Zutell & Allen, 1988).

More consistent were the differences in vocabulary in the bilingual and monolingual groups. In all three studies, the SEB children differed from the ME children on some measure of vocabulary. The SEB children had lower English expressive vocabulary scores even when controlling for SES. It should be underscored that bilingual children’s single-language vocabularies are typically lower than monolingual children’s, but their total conceptual vocabulary (i.e., number of
lexicalized concepts present in either language; Pearson, Fernández, & Oller, 1993) is larger than a monolingual’s. It is unclear whether having a larger cross-language vocabulary helps with reading in a given language, however. SEB toddlers’ spoken language comprehension has been found to be facilitated by vocabulary size in their active language, but not their inactive one (Marchman, Fernald, & Hurtado, 2010). That is, processing in English (in the spoken domain) is only helped by English, not Spanish vocabulary; and vice versa. Likewise, the study in Chapter 3 revealed that SEB children’s Spanish knowledge interfered with processing of written English words when they were form-similar to a Spanish word (regardless of whether they also shared meaning). Note that this finding contrasts with the result of a regression analysis showing that Spanish vocabulary helped offline (that is, untimed) English reading comprehension (Proctor et al., 2006).

In addition to the findings of the processing study in Chapter 3, the other studies revealed the impact of the SEB children’s less robust single-language vocabulary. Their written narratives had higher rates of lexical errors than their ME peers, and the differences between the two groups in expressive vocabulary persisted even after controlling for significant disparities in SES. Since vocabulary is a significant predictor of reading comprehension in SEB children (Proctor et al., 2005) which becomes increasingly important for later reading (e.g., Vellutino et al., 2007), one of the clearest conclusions to draw from the data is the need for enriching the lexicons of the SEB children. This issue is treated further in “Practical Applications of the Findings,” below.
The Impact of Demographic Factors on Language and Literacy

This section addresses how demographic factors impact language and literacy. The studies in this dissertation appear to be the first to find clear differences in demographic variables between ME and SEB children within the same schools. That is, even when controlling for institutional SES by recruiting children from the same school, there are still disparities in home SES: SEB children are more likely to come from low-SES homes than ME children. Bilingual status is thus confounded with institutional and home SES. Future studies of SEB children must address both kinds of types of socio-economic disparity. Neither one is sufficient by itself: the home SES disparity is unaddressed if only institutional SES is controlled, as the data in the Demographic and Linguistic Factors of Literacy study show (see Chapter 2).

Controlling for home SES alone by matching students selected from different schools does not account for differences in curricula and student body demographics (NELP, 2008; Ruiz de Velasco & Fix, 2000; Zhou, 2001).

With both home and school SES differences accounted for, SEB children showed comparable performance to ME children on the vast majority of tasks. These null results should be interpreted with caution, as they came after a significant reduction in sample size. The subsequent decrease in power should have been offset to a degree by controlling for a significant source of variability (i.e., disparities in home SES). Of all the effects of linguistic status found in Chapters 2 and 4, only two differences persisted in the SES-analysis: 1) on the vocabulary task from the Woodcock-Johnson 3, and 2) on the measure of phonological plausibility of spelling
errors in the written narrative. In addition, the SEB group was found to have an advantage relative to their ME classmates: in Chapter 2, the bilinguals outperformed the monolinguals in non-word decoding. In addition, the writing of SEB children had a trend towards significantly fewer pronoun errors than their ME peers. It appears that controlling for disparities in SES was a causal factor in the better performance seen in the SEB children relative to ME children. This finding fits with results from studies of high-SES bilinguals that suggest the existence of a bilingual advantage in certain kinds of tasks (reviewed in the next section).

The Bilingual Advantage for Spanish-English Bilingual Children

Previous research has revealed multiple vulnerable domains in the linguistic profile of SEB children. The studies here may be the first to show areas in which the SEB group, who are defined as having limited English proficiency by their schools, outperforms the ME group. With disparities in SES controlled, the SEB children were better than the ME children at non-word decoding (on the Woodcock-Johnson 3).

A bilingual advantage for decoding does not seem to be attested elsewhere in the literature. Nonetheless, non-word decoding is a strength for SEB children: it is typically comparable to their ME peers and often the only area in which they do not score significantly below monolinguals (e.g., Oller & Eilers, 2002). In other words, SEB children often have stronger English decoding than one would expect based on their overall English proficiency. In addition, a bilingual advantage for phonological awareness is attested in the literature (Bialystok, 2001b; Bialystok et al., 2003; Bruck & Genesee, 1995; Kang, 2012; Kuo & Anderson, 2010; Loizou & Stuart, 2003;
Phonological awareness is a strong predictor of decoding ability (see Chapter 1). It is logical that a bilingual advantage in phonological awareness would lead to a bilingual advantage in decoding, although the only study that appears to have assessed both phonological awareness and decoding (Bialystok et al., 2003) did not find a bilingual advantage for decoding (even though a bilingual advantage for phonological awareness was present).

**The Bilingual Lexicon in Development**

Numerous studies have gauged responses to cognates (words that share form and meaning cross-linguistically) and false cognates (words that share form but not meaning cross-linguistically) relative to non-cognates (words that neither share form nor meaning cross-linguistically) and found evidence for cross-linguistic activation in bilinguals (e.g., Dijkstra, 2007; Dijkstra et al., 1999; Dijkstra & van Heuven, 2002; Schwartz & Kroll, 2006; Schwartz et al., 2007; Sunderman & Schwartz, 2008; van Hell & Dijkstra, 2002; van Heuven et al., 1998). Such studies typically look at adults who meet a certain threshold for bilingualism (typically through self-rating proficiency in both languages). Only one study appears to evaluate cross-linguistic activation in bilingual children. In a lexical decision task, Dutch children’s responses were slowed when responding to cognates and false cognates (Brenders et al., 2011). These results mirror those reported in Chapter. However, the children in their study received systematic instruction in both their first (Dutch) and second (English) languages in school, while the children in Chapter 3 received minimal formal instruction in their first language (Spanish). The children in Chapter 3 were also
beginning readers, whereas Brenders et al. tested more experienced fifth-ninth grade students. The study in Chapter 3 is the first to indicate that exposure to show cross-linguistic activation in children at this age. The results indicate that lexical processing is highly interactive even at relatively modest levels of bilingualism, and gives strong support to models of bilingual lexical processing such as the Bilingual Interactive Activation + model (Dijkstra & van Heuven, 2002).

**Practical Applications of the Findings**

Earlier in this chapter, the implications of the SES differences between monolingual and bilingual children for research were raised. These SES differences have ramifications for policy-makers, as well. Specifically, they call into question whether all children should be held to the same standards, as is mandated in the No Child Left Behind act (NCLB; Public Law No. 107-110, 115 Stat. 1425, 2002) and the Common Core Standards (CCS; Council of Chief State School Officers & the National Governors Association Center for Best Practices). The data in Chapter 2 indicate that even at the same schools, SEB children are starting out at a disadvantage relative to ME children, given the disparities seen in demographic variables. While it is crucially important to foster achievement in the SEB group, and to give them the best possible education, holding them to criteria generated based on the expected performance of ME children seems unfair given the clear disparities between the two groups (cf. Ruiz de Velasco & Fix, 2000). In addition, the monolingual criteria used discounts the Spanish knowledge of the SEB children.
The strengths of the SEB children in the full cohort (i.e., before controlling for differences in SES) bear further comment. The SEB children were selected partially due to their limited proficiency in English. It is not surprising that they scored significantly below their ME peers in English oral comprehension and vocabulary and wrote narratives with greater proportions of morphological and lexical errors. What is noteworthy, however, is that the SEB children still fared as well as the ME children on the decoding measure; and wrote narratives that were of comparable length and complexity to those written by the ME group. This performance is all the more remarkable given that the SEB children came from more disadvantaged backgrounds than the ME children. Indeed, the lack of differences found between the two linguistic groups on many of the measures in spite of the disparities in SES between the two groups could almost be considered a bilingual advantage in its own right. That is, it is surprising the SEB children did not have poorer performance than they did given their background.

Can these disparities in SES be remedied? Certainly, the differences in parental education between the ME and SEB groups are not easily addressed. Increasing the availability of books in the SEB children’s environment is more straightforward, and could give them a better start in their early reading (e.g., Neuman, 1999; Neuman & Celano, 2001). Outreach programs that encourage parents to read to their children and make reading a fun activity may do likewise. Future research is necessary to evaluate the feasibility of such programs and what impact they have on reading outcomes in SEB children.
The preceding paragraphs discuss demographic factors. Obviously, for children with limited proficiency in English (as measured by the school) and a home language of Spanish, linguistic factors also have a major role to play in determining reading outcomes. The framework for reading presented by the Simple View (e.g., Gough and Tunmer, 1986) indicates two factors as important for reading: oral comprehension and decoding. Proctor and colleagues (2005) modified this framework to include vocabulary, as well. The data presented here speak to a question implicit in the model: what area do SEB children need most help with – decoding or oral language?

Certainly, oral language generally and vocabulary in particular seem to be the most vulnerable domains in the SEB group (e.g., August et al., 2005). SEB children have less robust vocabularies in either of their languages than their monolingual peers (for a review, see Chapter 1). This difference in English vocabulary persists even when controlling for disparities in SES, as in Chapter 2. A vocabulary intervention that included teaching multiple meanings of words and techniques for how to infer meaning by using context or knowledge of Spanish cognates has been used successfully with fifth grade SEB children (Carlo et al., 2004). The data from Chapter 3 suggest that explicit instruction in differentiating cognates from false cognates would also be useful for SEB children, to minimize the disruptive effects of false cognates on fluent reading.

The recommendation to focus on oral language is contrary to other studies recommending a focus on decoding for SEB children (Brice & Brice, 2009; Manis,
Certainly, strong decoding has been found to be more important than vocabulary for *early* reading in both SEB and ME children (Brimo & Apel, 2011; Hoover & Gough, 1990; Mancilla-Martinez & Lesaux, 2010; Proctor et al., 2006; Proctor et al., 2005; Vellutino et al., 2007). On the other hand, the study in Chapter 2 and other studies (Bialystok et al., 2003; Oller & Eilers, 2002; Oller et al., 2007) have indicated that non-word decoding is a robust skill in SEB children, which Gough and Tunmer (1986) assert is the purest measure of decoding ability. If decoding ability in the SEB group is comparable to that of the ME group, it seems inappropriate to focus extra attention on this skill when considering interventions for the SEB children.

The SEB group did have trouble with decoding of real words on the fluency task, at least for the first grade children. In addition, the SEB children’s written narratives contained a higher proportion of spelling errors and a higher proportion of those spelling errors were phonologically implausible – and spelling and decoding are highly correlated with each other (Ehri, 2001). While these results could be interpreted as providing motivation for decoding interventions in the SEB group, it is important to note that the effects seem to be driven by the lexical status of the items. That is, the SEB children had more difficulty with real words in English than with non-words, suggesting it is unfamiliarity with English words that drove the difference in performance on the decoding measures relative to the fluency and spelling measures. Rather than encouraging a focus on decoding skills, the data seem to reinforce the
importance of vocabulary interventions for the SEB children, particularly interventions that present words visually as well as orally.

**Future Directions**

The studies in this dissertation sought to explore the literacy profile of SEB children. Given that SEB children typically come from lower SES homes than ME children (in addition to Chapter 2, see, for example, Ruiz de Velasco & Fix, 2000), and the important role SES plays in mediating academic performance and reading, future studies could explore longitudinally how parental outreach programs and increased access to books impact attitudes towards reading in children and their comprehension. Loizou and Stuart (2003) theorized that exposure to a language with a simpler phonology than one’s native language provides a benefit to phonological awareness, but not vice versa. Since Spanish has a simpler phonology than English, providing formal instruction in Spanish to the SEB children would provide the opportunity to formally examine whether it leads to a bilingual advantage in phonological awareness. The study could then evaluate directly whether such a bilingual advantage leads to a subsequent advantage in decoding ability.

The study in Chapter 3 revealed cross-linguistic activation in children who were early readers with minimal formal instruction in a second language. Contrary to what is typically seen in adults, the children had slower responses to cognates relative to baseline. Brender's and colleagues (2011) found a similar result and attributed it to including false cognates as well as cognates in the stimuli. Another possible explanation for the result in the Chapter 3 study is that the children did not have
sufficient Spanish proficiency, as it has been theorized that a certain threshold in the home language is necessary to gain benefit from bilingualism (e.g., Cummins, 1979). To examine these competing explanations, a comparison of the performance of English-dominant SEB children (as with the study in Chapter 3) to bilinguals with proficiency in both languages responding to stimuli with and without false cognates could be carried out. Evidence of cognate facilitation in the balanced bilinguals and cognate interference in the English-dominant bilinguals would provide support for Cummins’ threshold hypothesis. If both groups of bilinguals show cognate facilitation when false cognates are not included in the stimuli, that would support the theory of Brenders and colleagues that the cognate interference effect stems from including false cognates alongside cognates.

The results from Chapter 3 also indicate that even early-stage bilinguals demonstrate cross-linguistic activation when exposed to words that share form across languages. It is unclear how much exposure to another language is necessary for words that are form-similar across languages to activate both lexicons. Furthermore, it is unclear whether the impact of cognates and false cognates increases with exposure, as representations are built up in the child’s lexicon, or decreases with exposure, as the child becomes more facile with switching between the two languages (e.g., Bialystok, 1999; Bialystok et al., 2008). A study of ME college students with varying degrees of exposure to Spanish could indicate how exposure affects cross-linguistic activation, as indexed by differential response to cognates and non-cognates.
Explicitly testing ME and SEB children’s use of pronouns in either the spoken or written domain would be useful to clarify the possibility of a bilingual advantage in proper pronoun use (as suggested in Chapter 4). Note that pronoun errors can be of a variety of types. Since Spanish uses grammatical gender and allows omission of subject pronouns, specific strengths might be seen in avoiding vague pronoun reference (i.e., by specifying which of many characters a pronoun may refer to) and correct use of gender pronouns (e.g., “The boy’s mother asks her son about his boat”).

A follow-up study evaluating the writing performance of older ME and SEB children would be useful in helping to clarify how the writing profile in the SEB group changes relative to the ME group.

Conclusions

SEB children are a growing population in United States public schools and there is a critical need for more information on how to best improve their reading and writing. The studies in this dissertation present a detailed profile of literacy in the SEB group from first through fourth grade. The data presented here should indicate the importance of increasing the emphasis on oral language skills and vocabulary in interventions for the bilinguals. In addition, the results should also inform clinical best practice, providing preliminary information on which linguistic domains are expected to be comparable between SEB children and their ME peers and which are not. By providing a picture of the strengths and weaknesses of SEB children with typical development, these data help improve the ability of school personnel to accurately identify reading and writing disorders in SEB children.
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