

ASSESSING THE LEXICAL RESTRUCTURING MODEL
IN BILINGUAL STUDENTS

By

Christine McClary

Bachelor of Arts, 2011
Boston College
Chestnut Hill, Massachusetts

Submitted to the Graduate Faculty of
The Harris College of Nursing and Health Sciences
Texas Christian University
in partial fulfillment of the requirements
for the degree of

Master of Science in Speech-Language Pathology

May 2016

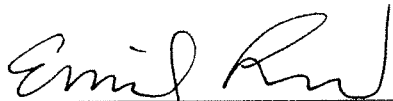
ASSESSING THE LEXICAL RESTRUCTURING MODEL
IN BILINGUAL STUDENTS

A Thesis for the Degree
Master of Science

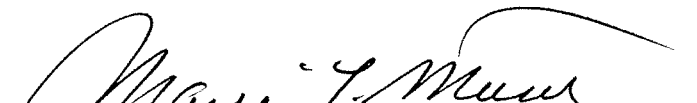
by

Christine Lynn McClary


Thesis Approved by:



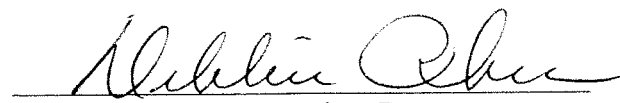
Emily Lund, Ph.D., CCC-SLP



Maria L. Muñoz, Ph.D., CCC-SLP



Danielle Brimo, Ph.D., CCC-SLP



Dr. Debbie Rhea, Associate Dean
Harris College of Nursing & Health Sciences

May 2016

ACKNOWLEDGEMENTS

I would like to express the deepest appreciation to my principal supervisor, Dr. Emily Lund, whose guidance, feedback, and patience made this project possible. Dr. Lund is not only a talented researcher but also a dedicated clinician, and I have seen that her concern for her clients is what informs every step of her research process. I feel incredibly fortunate to have received the opportunity to work alongside her and learn from her.

I would also like to thank my committee members, Dr. Maria Muñoz and Dr. Danielle Brimo, whose critiques and encouragement kept me on the right path. Working with Dr. Muñoz and Dr. Brimo was a joy and I learned so much from them in the process.

Thanks to funding from the Harris College of Nursing and Health Sciences, I was able to provide children's books to all the participants in this study, and was able to travel and present this research at the American Speech-Language-Hearing Association national convention in Denver, Colorado. Without funding from the Harris College, none of this would have been possible, and I am incredibly grateful for the support.

My sincere gratitude goes out to all of my colleagues in the speech-language pathology graduate program at Texas Christian University. You all have given me so much support, encouragement, and when needed, coffee, and for that, I am eternally grateful. Lastly, a special thank you to my family for your unending love and support. To my parents, thank you for always encouraging me to be the best that I can be.

TABLE OF CONTENTS

Acknowledgements	ii
List of Figures	v
List of Tables	vi
I. Literature Review	1
Introduction	1
Bilingual Advantage	1
Lexical Restructuring Hypothesis	2
Possible Explanations for the Bilingual Advantage	4
Conclusion	6
II. Purpose	8
Research Questions	8
III. Methodology	10
Participants	10
Participant Descriptive Assessment	12
Task Development	13
Procedures	16
Vocabulary Pre-test	16
Experimental Tasks	16
Data Collection	18
Data Analysis	18
Reliability	18
IV. Results	20

V. Discussion	24
Support for the Lexical Restructuring Hypothesis	24
Performance on LDE/HDS Words	25
Bilingual Advantage	27
Limitations	28
Implications and Future Directions	28
References	30
Appendices	33
Appendix A	33
Appendix B	34
Appendix C	37
Abstract	40

LIST OF FIGURES

Figure 1.	Total phonological awareness score by group and neighborhood density category.	21
Figure 2.	Scores on sound blending task by group and neighborhood density category.	22

LIST OF TABLES

Table 1.	Mean Language Use and Proficiency Scores of Bilingual Participants from Teacher Survey	12
Table 2.	Mean Standard Scores and Standard Deviations Obtained on <u>EOWPVT</u> and <u>PTONI</u>	13
Table 3.	Distribution of Word Types Across Phonological Awareness Tasks	17
Table 4.	Average and Standard Deviation of Scores on Experimental Tasks by Group	20
Table 5.	Results of Regression Analysis of Phonological Awareness Score and Vocabulary Knowledge	23

Chapter I

Literature Review

Introduction

Phonological awareness skills are foundational to literacy development and, in turn, academic achievement (Kirsch, Jungeblut, Jenkins, & Kolstad, 2002). It is essential that we understand how children acquire these skills. The National Reading Panel (NRP) finds that certain early-emerging skills predict later literacy success (National Institute of Child Health and Human Development, 2000). One of these skills is phonological awareness, the ability to analyze the sounds of a language. Children must begin to understand that orthographic representations (i.e., letters) represent sounds and sound segments of words to be able to decode words fluently (National Institute of Child Health and Human Development, 2000). Students who struggle to develop the skills of phonological awareness struggle, in turn, with learning to read. This leads to a literacy gap in schools between children who struggle to develop preliteracy skills, such as disadvantaged language learners and children from low-income communities, and those who are able to easily develop preliteracy skills. It is essential that we understand how phonological awareness is acquired because phonological awareness is critical to academic success.

Bilingual Advantage

Studies have shown that bilingual children sometimes display an advantage in performance on phonological awareness tasks over their monolingual peers. Branum-Martin, Tao, Garnaat, Bunta, and Francis (2012) performed a meta-analysis of 101 correlations from 38 studies measuring phonological awareness in bilingual children from a variety of language backgrounds. Performance on phonological awareness measures in languages other than

English, particularly alphabetic languages such as Spanish, are highly related to phonological awareness measures in English (Branum-Martin, et al., 2012). This high degree of correlation across phonological awareness measures in English and Spanish indicates cross-linguistic transfer may occur between tasks and provide bilingual children with an advantage in developing these skills. However, more research is needed to determine the nature of these potential transfer effects (Branum-Martin, et al., 2012).

An advantage in phonological awareness for Spanish-English bilingual children is particularly relevant due to the growing population of Spanish speakers in the United States. Durgunoglu, et al. (1993) performed a study investigating the cross-linguistic transfer of phonological awareness in 27 Spanish-speaking first grade students. The students, all beginning readers, were tested on phonological awareness abilities in Spanish and word recognition in English. Students who performed well on Spanish phonological awareness tests were more likely to be able to read English words and English-like pseudowords than children who performed more poorly on phonological awareness tasks (Durgunoglu, et al., 1993). Thus, cross-linguistic transfer between phonologically similar languages such as English and Spanish can have a facilitative effect on phonological awareness and, in turn, literacy development.

Lexical Restructuring Hypothesis

The Lexical Restructuring Hypothesis provides one explanation of why bilingual children display an advantage over monolingual children in phonological awareness tasks. The Lexical Restructuring Hypothesis proposes that phonological awareness develops as children's vocabularies grow and children begin to restructure their word representations (Walley, Metsala, & Garlock, 2003). When children initially learn words, they do not need

to differentiate words at the phoneme level; holistic representations are sufficient to differentiate words that are phonologically very different (e.g., *cat* and *dog*). However, as words are acquired that share the same phonological features (i.e., words with high neighborhood density such as *cat*, *hat*, and *mat*), children must attend to the phonemes of words because holistic representations are no longer sufficient. Increasingly segmental representations of words allow for emergence of phonological awareness because phonologically similar words may help children attend to the sound structure of language. In accordance with this hypothesis, children are first able to identify and manipulate syllables before they begin to identify and manipulate individual phonemes.

If the Lexical Restructuring Hypothesis is a valid account of phonological awareness development, the “bilingual advantage,” particularly as it pertains to languages phonologically similar to English (e.g., Spanish), may be a result of this lexical restructuring. Previous studies comparing bilingual children with different language backgrounds have found mixed results in terms of a bilingual advantage (see Branum-Martin, et al., (2012) for a review). An advantage in phonological awareness and other language tasks is more often seen in Spanish-English bilinguals than, for example, in Vietnamese-English bilinguals. The Lexical Restructuring Hypothesis states that children begin to restructure their lexicons once phonologically similar words are introduced into their vocabulary. Because Spanish and English are phonologically similar languages and Vietnamese and English share fewer similarities, the Lexical Restructuring Hypothesis presents a possible explanation for why this advantage is stronger in Spanish-English bilinguals and less evident in bilinguals whose two languages share less phonological similarity.

If this study determines that the Lexical Restructuring Hypothesis explains how children acquire phonological awareness, this finding will enhance understanding of language and literacy development and impact the way professionals teach children from a variety of language backgrounds. Demonstrating that the phonological similarity between Spanish and English actively contributes to children's phonological awareness development would provide a strong reason to support home language growth. As more educators and clinicians are working with the growing bilingual population in the United States, understanding the best practices of supporting language and literacy development is essential. Confirming the Lexical Restructuring Hypothesis as an explanation for how children develop phonological awareness would strengthen the support for encouraging bilingualism and home language use, particularly in the Spanish speaking population. This knowledge could also impact the way educators and clinicians teach students. If professionals know that phonologically similar words within and across languages facilitate building phonological awareness, then these are the words professionals should use in interventions with struggling students. This understanding would enhance the ability of educators to help their students develop essential pre-literacy skills.

Possible Explanations for the Bilingual Advantage

Alternatively, a bilingual advantage in phonological awareness may not have a basis in lexical knowledge. Phonological awareness, if not supported by the Lexical Restructuring Hypothesis, may be the result of a broader bilingual advantage. Extant studies have demonstrated improved executive functioning in bilingual individuals. For example, Bialystok (1988) compared the performance of monolingual and bilingual children on a task of linguistic arbitrariness. Bilingual children demonstrated higher performance than

monolingual children, indicative of greater ability to manipulate words in language while inhibiting meaning (e.g., calling the “sun” the “moon” when instructed to by an examiner). Bialystok and Martin (2004) extended this finding to show that bilingual children demonstrate better inhibitory control in non-linguistic tasks than monolingual children. Thus, an advantage in phonological awareness may be derived from a general advantage in inhibition control: that is, bilingual children may inhibit word meaning to better manipulate phonemes than monolingual children. Determining the basis of phonological awareness in bilingual children will inform our understanding of language and literacy development in this group.

Despite the possibility that a cognitive advantage may explain bilingual children’s advantage over monolingual children in phonological awareness tasks, extant literature shows emerging support for the Lexical Restructuring Hypothesis. Some studies have demonstrated a relation between phonological awareness and vocabulary knowledge in bilingual children. Rolla San Francisco, Carlo, August, and Snow (2006) explored the influence of vocabulary on bilingual children’s phonological awareness performance in English. Eighty Spanish-English bilingual children and 22 monolingual English children completed a range of tasks. Bilingual children completed vocabulary measures in Spanish and English, and monolingual children completed vocabulary measures in English. All children completed a sound segmentation task in English to assess phonological awareness performance. Results demonstrated a relation between vocabulary knowledge and performance on the phonological awareness task. Bilingual children who demonstrated high vocabulary knowledge in either English or Spanish tended to perform better than bilingual children who demonstrated lower vocabulary knowledge in both languages. These findings

ASSESSING THE LEXICAL RESTRUCTURING MODEL IN BILINGUAL STUDENTS

indicate that regardless of the language in which children had developed high vocabulary knowledge, and therefore higher levels of neighborhood density, phonological awareness performance was facilitated by that vocabulary knowledge.

A study conducted by Lund, Werfel, and Schuele (2014) also found emerging evidence to support the Lexical Restructuring Hypothesis by demonstrating a link between vocabulary development and phonological awareness performance. Participants in the study were English monolingual and Spanish-English bilingual children with and without hearing loss. The study compared the performance of the four groups of children on phonological awareness and receptive and expressive vocabulary measures. Across bilingual and monolingual normal hearing groups, performance on vocabulary measures correlated with performance on phonological awareness tasks, providing support for the idea that phonological awareness develops as a child's lexicon grows (Lund, et al., 2014). However, these findings were not definitive, because for children with hearing loss, vocabulary knowledge was not correlated with phonological awareness performance. More research is needed across a larger sample size to determine whether or not vocabulary knowledge consistently correlates with phonological awareness skills in bilingual children with normal hearing.

Conclusion

The purpose of this study is to address how bilingual children's lexical knowledge in two languages may contribute to phonological awareness. Based on the principles of the Lexical Restructuring Hypothesis, we expect to demonstrate that simultaneously increasing lexical knowledge in two languages that are phonologically similar (i.e. Spanish and English) has a facilitative effect on phonological awareness for bilingual children. This will be

ASSESSING THE LEXICAL RESTRUCTURING MODEL IN BILINGUAL STUDENTS

achieved by looking for the effect of word density on the phonological awareness performance of monolingual versus bilingual children.

Chapter II

Purpose

The objective of this study is to consider how bilingual children's lexical knowledge in two languages contributes to phonological awareness. The central hypothesis is that simultaneously increasing lexical knowledge in two languages that are phonologically similar (i.e. English and Spanish) will have a facilitative effect on phonological awareness performance for bilingual children. The results of this study are expected to demonstrate whether the Lexical Restructuring Hypothesis provides a possible explanation of the phonological awareness advantage of bilingual children over monolingual children. Such a finding would help to establish an understanding of how the Lexical Restructuring Hypothesis predicts lexical and phonological awareness growth in bilingual children.

Research Questions

As demonstrated by numerous studies (see Branum-Martin, et al. (2012) for review), bilingual children often demonstrate an advantage in phonological awareness. The Lexical Restructuring Hypothesis provides a potential explanation of this advantage. The central question of this project is, therefore, how bilingual children's lexical knowledge in two languages contributes to phonological awareness. If the Lexical Restructuring Hypothesis provides a valid explanation, then we expect to see the effects of neighborhood density on bilingual children's performance on phonological awareness tasks during development.

Specific research questions for this study are as follows:

1. Is there a relation between performance on phonological awareness tasks and vocabulary knowledge, regardless of condition or group membership?

2. Do Spanish-English bilingual children perform equally as well as monolingual English-speaking children on phonological awareness tasks containing words with high neighborhood density in Spanish and English?
3. Do Spanish-English bilingual children perform equally as well as monolingual English-speaking children on phonological awareness tasks containing words with high neighborhood density in English and low neighborhood density in Spanish?
4. Do Spanish-English bilingual children perform better than monolingual English-speaking children on phonological awareness tasks containing words with low neighborhood density in English and high neighborhood density in Spanish?
5. Do Spanish-English bilingual children perform similarly to monolingual English-speaking children on phonological awareness tasks containing words with low neighborhood density in both Spanish and English?

Chapter III

Methodology

Participants

Twelve bilingual and ten monolingual typically-developing children (age range: 5;8-7;6) participated in the study. All participants had normal vision and hearing per parent and teacher report. All participants, with the exception of one monolingual participant, were recruited from one public elementary school in Fort Worth, Texas. The elementary school serves a predominantly Hispanic and African American student population. According to campus demographic data from 2014, 89.1% of students at the school are economically disadvantaged and 64.4% are English language learners. The school places students in either monolingual English classrooms or bilingual English-Spanish classrooms that follow a dual-language education model. Dual-language classes are offered at all grade levels, from Pre-Kindergarten through fifth grade.

The one remaining monolingual participant was recruited via advertising on the Texas Christian University campus. This monolingual participant demonstrated characteristics (e.g., parent education level, socioeconomic status, nonverbal intelligence score) that were consistent with the monolingual participants recruited from the elementary school. This participant attended a nearby elementary school in Fort Worth, Texas.

All students whose parents returned signed consent documents were included for descriptive testing, and those who met criteria for participation in the study also completed the experimental tasks.

To ensure that children recruited as bilingual participants were truly bilingual, a number of criteria were set to determine bilingual status. Children qualified as bilingual in

Spanish and English if they: (a) were enrolled in a dual language or bilingual education program at their school; (b) were identified as bilingual by teacher survey; and (c) were identified as bilingual by parent survey. Parent and teacher surveys that establish levels of language exposure developed by Gutiérrez-Clellen and Kreiter (2003) were used, as they were found to be accurate predictors of a child's bilingual status. A native Spanish speaker unaffiliated with the aims of the study translated the surveys into Spanish. Teachers and parents had the opportunity to complete the survey in either language. Additionally, a brief language sample was video recorded with each child following the Hadley protocol to further corroborate proof of bilingualism found in school records, teacher surveys, and parent interviews (Hadley, 1998).

The teacher language survey asked teachers to rate students' language use (how often the child uses a language) and proficiency (how well the child uses a language) (see Appendix A). Teachers rated students on a scale from zero, meaning the child has no use or proficiency, to four, meaning the child uses the language all the time and has native-like proficiency. In their study, Gutierrez-Clellen and Kreiter (2003) used a score of three or above to indicate sufficient use and proficiency to be considered bilingual on their second-grade participant sample. Teacher surveys in this study corroborated participants' bilingual status (see Table 1). Teacher ratings of children's proficiency and use in English averaged below a level three, however, these scores were deemed reflective of appropriate levels to reflect bilingualism given students' ages.

Table 1

Mean Language Use and Proficiency Scores of Bilingual Participants from Teacher Survey

	Language Use Score	Language Proficiency Score
Spanish	3.92	3.92
English	2.86	2.42

Note. A score of zero indicates no use or proficiency in the language. A score of four indicates consistent use and native-like proficiency in the language.

The parent language survey asked parents to answer questions about family history of language disorder, their child's exposure to English and Spanish at different ages and across contexts, and current patterns of language use in the child's home (see Appendix B). Fifty percent of parents of bilingual children indicated that their child was exposed to both English and Spanish growing up, and 50% indicated that their child was exposed to only Spanish until entering school. Regarding their child's current language status, 58% of parents indicated that their child currently uses both English and Spanish to communicate with family at home, and 100% of parents indicated that their child is currently exposed to both English and Spanish at home.

Participant Descriptive Assessment

Participants completed the Expressive One Word Picture Vocabulary Test (EOWPVT; Monolingual or Bilingual edition, depending on group; Brownell, 2001) and the Primary Test of Nonverbal Intelligence (PTONI; Ehrler & McGee, 2008). The bilingual edition of the EOWPVT accounts for children's vocabulary knowledge in two languages, and standard scores are based on a bilingual normative sample (Brownell, 2001). Children were excluded from the study if their scores on the PTONI or EOWPVT indicated below average performance, as indicated by a standard score of less than 85 (see Table 2). Of the 23

children initially recruited, one child scored below the range of normal on the PTONI, and was not invited to complete the experimental tasks.

Table 2

Mean Standard Scores and Standard Deviations Obtained on EOWPVT and PTONI

	Age	<u>EOWPVT</u>	<u>PTONI</u>
Monolingual English (n = 10)	6.26 years (.63)	101.8 (8.32)	98.1 (17.15)
Bilingual English-Spanish (n = 12)	6.13 years (.33)	112.9 (8.32)	96.9 (14.7)

Note. EOWPVT tests for vocabulary knowledge and PTONI tests for nonverbal intelligence. Standard deviations appear in parentheses below means.

Task Development

The central hypothesis of this study was that bilingual children will perform differently from monolingual children on phonological awareness tasks based on the neighborhood density of the words relative to the children's lexicons. In order to test this hypothesis, words were selected from the typical lexicon of a Kindergarten-aged child (Moe, Hopkins, & Rush, 1982), and were then coded based on their neighborhood density relative to English and Spanish. This coding resulted in four lists of English words that were:

1. high density in relation to English, and high density in relation to Spanish
(HDE/HDS)
2. high density in relation to English, and low density in relation to Spanish (HDE/LDS)
3. low density in relation to English, and high density in relation to Spanish (LDE/HDS)
4. low density in relation to English, and low density in relation to Spanish (LDE/LDS)

To reiterate, all words in the above lists were English words, with high or low neighborhood density levels *relative to* English and Spanish. For example, 15 words were identified as having low density in English and high density in Spanish (e.g. “llama,” with no English neighbors and at least 7 Spanish neighbors) and 15 words were identified as having low density in both English and Spanish (e.g., “orange,” with no neighbors in English or Spanish).

To identify words for the experimental task, the authors selected 60 English words from the typical lexicon of an English-speaking Kindergartener (Moe, et al., 1982). Words were selected that could be easily represented by pictures. Once words were selected, they were entered into the Storkel and Hoover database to determine their phonological density relative to English (Storkel & Hoover, 2010). Thirty words with neighborhood density in the highest quartile of the Storkel and Hoover database, and 30 words with neighborhood density in the lowest quartile of the Storkel and Hoover database were identified. These two groups formed the HDE and LDE word lists.

Following the creation of these two word lists, each word within the two groups was further classified as being of high or low neighborhood density relative to Spanish. To determine neighborhood density relative to Spanish, the following procedure was used. First, the English words written phonetically following Spanish orthographic patterns by the first author, who is a native speaker of English and has verbal and written fluency in Spanish. For example, the word “arrow” was transcribed as “aro.” Next, the transcribed word was entered into the BuscaPalabras database, which produced a list of orthographic and phonological neighbors in Spanish (Davis & Perea, 2005). Finally, the first author reviewed the list of generated words, removing any duplicates or non-words, and adding phonological neighbors

that the database did not produce. This process was completed for each of the sixty English words, until each was assigned a number of phonological neighbors in Spanish. A word was considered high density in Spanish if it had seven or more phonological neighbors, and low density in Spanish if it had no phonological neighbors, because within the BuscaPalabras database, those criteria mark the upper and lower quartile cutoffs.

Additional analyses were completed to verify that the lists of phonological neighbor words in Spanish were, in fact, words with which Kindergarten-age bilingual children would be familiar. A survey was administered to two native Spanish-English speaking bilingual adults who worked as teachers at the school from which children were recruited for this study. The teachers were given a list of the phonological neighbor words in Spanish and asked the following questions: (1) would a typical Kindergarten student have heard this word before; and (2) would a typical Kindergarten student understand this word in a sentence? The teachers could respond “yes,” “no,” or indicate that the item was “not a word” in Spanish. The teachers estimated that Kindergarten students would have heard 39.4% of the Spanish phonological neighbor words, and would understand 47.7% of the words if they were used in a sentence. Estimated neighborhood density was lower than anticipated. These numbers are likely an underestimate due to confusion with the survey. Consequently, the results of this survey must be interpreted with caution. We feel confident using these words as indicators of neighborhood density, since Spanish has a relatively repetitive and predictive phonological structure (Dalbor, 1997). These words are likely high neighborhood density for participants because they follow Spanish phonological rules with which Kindergarten-age children would be familiar.

A photograph-quality picture card with a white background was created for each of the 60 words. A third-party graduate research assistant selected pictures for the cards, and the authors verified representativeness of the pictures.

Procedures

Following the descriptive assessment outlined above, each participant completed one vocabulary pre-test and three experimental tasks. Children interacted one-on-one with the examiner to complete experimental tasks, which were administered in English. Only English tasks were included for a number of reasons: first, current research has established that phonological awareness skills transfer between the two languages in typically developing bilingual children (Branum-Martin, et al., 2012); and second, academic performance is still predominantly assessed in English in the public schools, so understanding how bilingual children perform on stimuli in English is of primary concern.

Vocabulary pre-test. Expressive knowledge of the 60 words used in the experimental tasks was assessed by the examiner. The examiner presented each child with the picture vocabulary cards, one at a time, and asked, “What is this?” If a child produced an approximation of the target word (e.g., “pita” for “pizza”), the approximation was noted and counted as correct as long as (a) the child closely represented each of the vowels in the word, and (b) produced one sound for each sound present in the target word (e.g., no credit for “pia” for pizza). Patterns of articulation error were taken into account on the experimental tasks. From the 60 words assessed, 12 words from each group (HDE/HDS; HDE/LDS; LDE/HDS; and LDE/LDS) known by the participant were selected.

Experimental tasks. For the 48 words identified, each child completed a range of phonological awareness tasks: 16 sound matching trials (e.g., what word starts with the same

sound as this word?), 16 sound identification trials (e.g., what is the first sound you hear in this word?), and 16 sound blending trials (e.g., I am going to tell you some separate sounds that make up a whole word. Tell me what word you think that these sounds make.) Trials from each type of task (sound matching, sound identification, sound blending) focused equally on HDE/HDS words, HDE/LDS words, LDE/HDS words, and LDE/LDS words (i.e. the four neighborhood density conditions; see Table 3). Performance on each trial was counted as correct or incorrect. If a child who made a consistent articulation error in the expressive task continued to make that error in the phonological awareness task, then that trial was counted as correct. Trials were counterbalanced by type (sound matching, sound identification, sound blending) and by individual word within each type across participants.

Table 3

Distribution of Word Types Across Phonological Awareness Tasks

	Neighborhood Density Categories				Total Trials by Phonological Awareness Task
	HDE/HDS	HDE/LDS	LDE/HDS	LDE/LDS	
Sound Matching	4 trials	4 trials	4 trials	4 trials	16 trials
Sound Identification	4 trials	4 trials	4 trials	4 trials	16 trials
Sound Blending	4 trials	4 trials	4 trials	4 trials	16 trials
Total Trials by Word Type	12 trials	12 trials	12 trials	12 trials	48 total trials/words

Note. Word type refers to neighborhood density category. HDE refers to high density English words; LDE refers to low density English words; HDS refers to high density Spanish words; LDS refers to low density Spanish words.

Data Collection

Three trained examiners administered the tasks. During the assessment, each child was seated across the table from an examiner, and positioned such that they were facing away from other participants to minimize distractions. All sessions were either video or audio recorded.

Examiners scored children's answers as correct or incorrect, and recorded the responses on a recording sheet (see Appendix C).

Data Analysis

Each participant could obtain a total phonological awareness score of 48 on the three experimental tasks combined. This score can be broken down into 16 trials within each of three experimental tasks (i.e. sound matching, sound identification, sound blending), or 12 trials within each of four conditions (i.e. neighborhood density categories). Group differences were analyzed with a mixed (2 x 3) analysis of variance with group (i.e. monolingual, bilingual) as the between subjects independent variable, neighborhood density (i.e. HDE/HDS, HDE/LDS, LDE/HDS, LDE/LDS) as the within-subjects independent variable, and number of correct phonological awareness trials provided as the dependent variable. Tests for normality (Shapiro-Wilk as confirmed by a quantile-quantile plot) confirmed that ANOVA was an appropriate analytical tool. To answer questions about the contribution of vocabulary knowledge to phonological awareness performance, linear regression was used. Main/interaction effects were analyzed with linear contrasts.

Reliability

A third-party graduate research assistant reviewed video and audio recordings of 33% of tasks and scored those tasks. Scoring reliability was calculated via point-by-point

comparison. Across tasks and groups, reliability remained above 90%, so the scoring of original examiners were used for analysis.

Chapter IV

Results

Children completed three experimental phonological awareness tasks, each with a total of four points possible per neighborhood density category. Mean and standard deviation were calculated by group for each task and density category (see Table 4).

Table 4

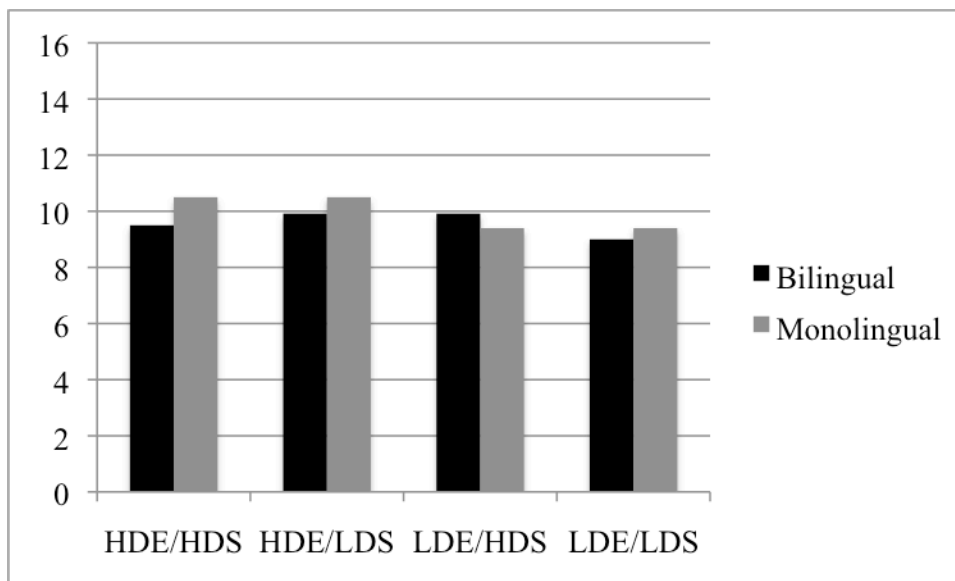
Average and Standard Deviation of Scores on Experimental Tasks by Group

	Bilingual	Monolingual
Matching		
HDE/HDS	3.25 (.97)	3.60 (.70)
HDE/LDS	3.33 (.98)	3.30 (.67)
LDE/HDS	3.33 (.98)	3.30 (1.06)
LDE/LDS	3.00 (1.65)	3.20 (1.32)
Identification		
HDE/HDS	3.33 (.78)	3.80 (.42)
HDE/LDS	3.67 (.49)	3.90 (.32)
LDE/HDS	3.75 (.87)	3.90 (.32)
LDE/LDS	3.92 (.29)	3.70 (.48)
Blending		
HDE/HDS	2.92 (.67)	3.10 (1.20)
HDE/LDS	2.92 (.79)	3.30 (.82)
LDE/HDS	2.83 (.94)	2.20 (1.48)
LDE/LDS	2.08 (.90)	2.50 (1.43)

Note. Standard deviations appear in parentheses following means. Total score possible on each task was four. HDE = high density relative to English; LDE = low density relative to English; HDS = high density relative to Spanish; LDS = low density relative to Spanish

To determine the effect of neighborhood density across participant groups (i.e. to answer research questions two through five), analysis of variance calculations were applied to the data. First, we calculated a 2 x 4 analysis of variance with total phonological awareness score as the dependent variable, group as a between-subjects variable and conditions as a within-subjects variable. For total phonological awareness score, no main effect of group or

condition was found ($F(1, 84) = .866, p = .355$ and $F(1, 84) = 2.579, p = .112$ respectively; see Figure 1).



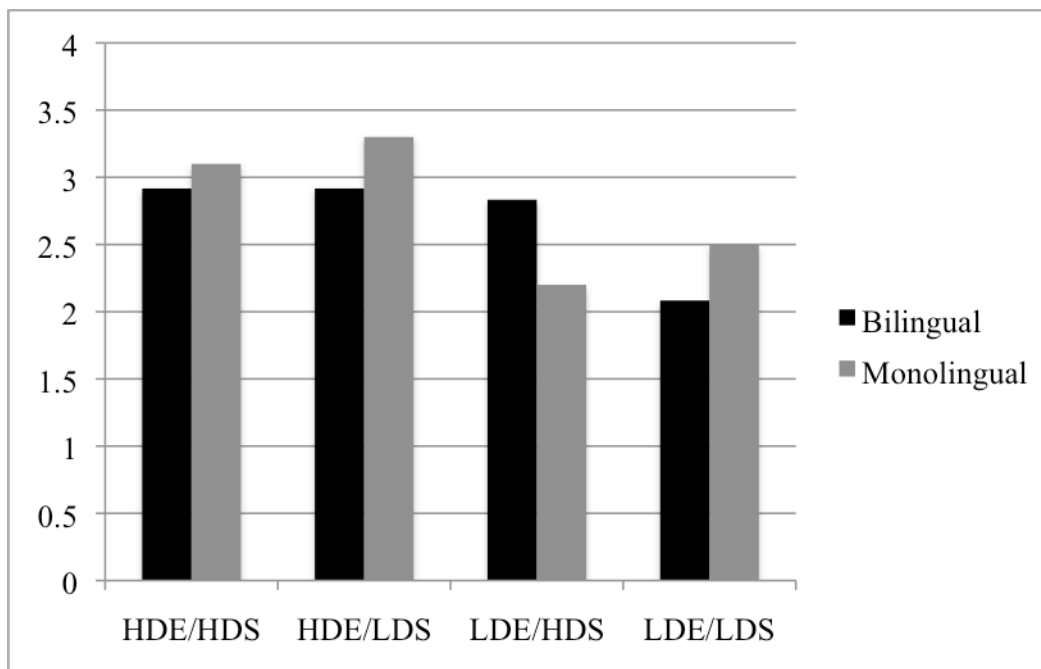
Note. HDE = high density relative to English; LDE = low density relative to English; HDS = high density relative to Spanish; LDS = low density relative to Spanish

Figure 1. Total phonological awareness score by group and neighborhood density category. HDE = high density relative to English; LDE = low density relative to English; HDS = high density relative to Spanish; LDS = low density relative to Spanish

Because three different phonological awareness tasks were used, and those tasks represented a range of difficulty, the raw data were examined by the authors. The third task, blending, represents the most difficult phonological awareness skill and one that is perhaps the most necessary for reading success. Examination of the data indicated that both groups performed near ceiling on the matching and identification phonological awareness tasks, but not on the blending tasks. Thus, additional analyses were conducted with only the blending task results (see Figure 2).

A 2 x 4 analysis of variance was calculated with number correct blending trials as the dependent variable, group (monolingual or bilingual) as the between-subjects variable, and

conditions (density category) as the within-subjects variable. This analysis yielded a main effect of condition ($F(1, 84) = 7.38, p = .007$) and an interaction effect between group and condition $F(1, 84) = 4.28, p = .04$). Follow-up linear contrasts indicated significantly higher performance for: high-density versus low-density words, regardless of group ($F(1, 42) = 1.91, p = .03, d = .43$); and significantly higher performance for bilingual children for LDE/HDS words than monolingual children ($F(1, 20) = 2.01, p = .03, d = 1.05$).



Note. HDE = high density relative to English; LDE = low density relative to English; HDS = high density relative to Spanish; LDS = low density relative to Spanish

Figure 2. Scores on sound blending task by group and neighborhood density category.

To answer the final question, whether there is a relation between performance on phonological awareness tasks and vocabulary knowledge, regardless of condition or group, a regression analysis was conducted (see Table 5). Expressive vocabulary knowledge of participants, separate from group or condition, related to performance on the blending phonological awareness task. Children with higher expressive vocabulary knowledge tended to perform better than children with lower expressive vocabulary knowledge, regardless of

group membership or density category. This analysis also indicated that a main effect of group and of condition were maintained, even when expressive vocabulary knowledge was controlled.

Table 5

Results of Regression Analysis of Phonological Awareness Score and Vocabulary Knowledge

	Coefficient	Standard Error	P-value
Group	-1.57	1.65	.34
Condition	-.27	.09	.005
Group:Condition	.52	.26	.045
<u>EOWPVT</u>	.04	.013	.003

Note. Adjusted R-squared = 0.1438. Overall F = 5.87. $p < 0.01$

Chapter V

Discussion

This study compared the relation between phonological awareness and vocabulary skills of monolingual and bilingual children. The Lexical Restructuring Hypothesis was examined as a potential explanation of phonological awareness development and the widely reported bilingual advantage. If children's performance on phonological awareness tasks varies between groups and conditions, there may be a reason to differentiate instruction to monolingual and bilingual children who struggle to develop phonological awareness.

Findings indicated that both bilingual and monolingual children in this study who displayed higher vocabulary knowledge tended to perform better on all conditions on phonological awareness tasks. Additionally, children performed better on high density English (HDE) words than low density English (LDE) words, regardless of group. When bilingual and monolingual children's performance was compared on the hardest task, sound blending, bilingual children displayed an advantage over monolingual children on the LDE/HDS condition.

Support for the Lexical Restructuring Hypothesis

The Lexical Restructuring Hypothesis proposes that phonological awareness develops as children's vocabularies grow (Walley, et al., 2003). Findings indicated that children with higher vocabulary knowledge tended to perform better on all conditions, regardless of language background. Both bilingual and monolingual children in this study performed in accordance with this hypothesis on phonological awareness tasks.

When performance on phonological awareness tasks was analyzed across conditions (i.e. word density categories), findings indicated that all children tended to perform better on

HDE words than LDE words. The Lexical Restructuring Hypothesis states that as children begin to learn more high density words that share phonological features, they begin to restructure their word representations. According to the Lexical Restructuring Hypothesis, it is easier for children to phonologically manipulate words that are high density because they have common phonological features with which children are familiar (Walley, et al., 2003). Both bilingual and monolingual children demonstrated this tendency. Bilingual and monolingual children's shared tendency to perform better on HDE words was expected, since both groups could rely on their knowledge of English phonological patterns and vocabulary.

Performance on LDE/HDS words

One hypothesis of this study was that bilingual children would demonstrate an advantage over monolingual children on words that were high density relative to Spanish and low density relative to English. This hypothesis was based on the principle of lexical restructuring, that children perform better on high density words. Spanish-English speaking bilingual children, therefore, were predicted to have an advantage on phonological awareness tasks in which the words shared phonological features with words in Spanish, but not in English. Bilingual children would be able to draw on knowledge of Spanish and its common phonological structures in a way that monolingual English-speaking children could not. Monolingual children, having only vocabulary in English and exposure to English phonological structures, could only rely on the word density in relation to English. Therefore, with words that were LDE/HDS, bilingual children would be able to rely on high density phonological features of Spanish to help them complete the phonological awareness task, whereas monolingual children had to rely only on the English features, which would be low density in this case.

Children's performance on the LDE/HDS condition was analyzed separately in order to test this hypothesis. Monolingual and bilingual children's overall performances on phonological awareness tasks with LDE/HDS words were not significantly different. Children's performances on the three phonological awareness tasks (i.e. sound matching, sound identification, sound blending) were then analyzed separately. Findings indicated no significant difference between monolingual and bilingual children's performance on sound matching or sound identification tasks in the LDE/HDS condition. However, findings did indicate an advantage for bilingual children compared to monolingual children on the sound blending task in the LDE/HDS condition.

This advantage may have been displayed only on the sound blending task and not on the sound matching or sound identification tasks because sound blending was the most difficult of the three phonological awareness tasks children completed (Schuele & Boudreau, 2008). Potentially, children performed too close to ceiling on the sound identification and sound blending tasks for differences in performance between groups across conditions to be detected.

The significant findings for the sound blending task on the LDE/HDS condition provide support for the Lexical Restructuring Hypothesis. Bilingual children likely were able to use their familiarity with Spanish phonology to help them manipulate English words that shared common phonological features with words in Spanish. English-speaking monolingual children performed more poorly compared to bilingual children on this task, as these words did not follow the most common phonological patterns of English.

Bilingual Advantage

Extant research has demonstrated that bilingual children sometimes display an advantage in phonological awareness performance over their monolingual peers (Branum-Martin, et al., 2012). Overall, a bilingual advantage was not observed in this study. With the exception of the LDE/HDS condition on the sound blending task, discussed above, bilingual children did not perform significantly better than monolingual children on all phonological awareness measures, only with a particular task and density category.

A number of factors may have impacted these results. First, children who participated in this study came from low socioeconomic backgrounds, meaning there could be other factors at play impacting their performance. Seminal studies establishing a bilingual advantage in executive function and linguistic tasks, such as Bialystok (1988) and Bialystok and Martin (2004), included bilingual and monolingual children from significantly higher socioeconomic backgrounds than those included in this study. Additionally, other researchers have indicated that some studies establishing a bilingual advantage may not have properly controlled for possible differences in participant characteristics such as ethnicity and socioeconomic status (Morton & Harper, 2007). It is possible that there are other factors affecting the performance of the children in this study that we were unable to account for in our analysis of the results. Despite this, and despite the possibility that an overall bilingual cognitive advantage may be attenuated by controlling for differences in socioeconomic status, an effect by word density was observed on the sound blending, the most challenging task in this study. This finding indicates that even in low socioeconomic settings there may still be an advantage to being bilingual.

Limitations

The limitations of this study provide avenues for future directions. A larger sample size would allow for a more complete assessment of how language background, vocabulary knowledge, and word density impacted children's phonological awareness performance. In this study, phonological awareness performance was assessed using only English words. Assessing bilingual students' phonological awareness abilities in both languages would provide a fuller picture of their abilities and allow for more in-depth analysis. Additionally, only three, simple phonological awareness tasks were used to assess children's abilities, and many children performed at or near ceiling on the sound matching and sound identification tasks. Including additional, more rigorous tasks such as sound segmentation may better differentiate children's performance across density categories. More rigorous tasks may require children to rely more fully on the common phonological features of high density words to help them complete the task. In this study, a novel procedure was used to sort the English stimulus words into Spanish density categories. Future research should strive to establish valid methods for determining word density across phonologically similar languages. Lastly, many variables may have impacted the performance of the low socioeconomic status children who participated in this study. For example, there may have been effects of teacher, classroom, or home life that we were unable to account for in our analyses. Future studies should seek to account for these variables and consider others which may impact the performance of children from diverse backgrounds.

Implications and Future Directions

Only typically developing children were included in this study to provide a foundation for future research. The typically developing children in this study demonstrated

higher performance overall on high density words than low density words. This finding may have implications for children with communication disorders. For example, it may be important to consider word density in selection of stimulus words for therapy for children who struggle to develop phonological awareness. It may be advantageous to utilize words that are high density during therapy activities to introduce new skills. Future research should explore the implications of these findings for children with communication disorders.

Further research should also investigate how word density affects performance in children with diverse linguistic backgrounds and low socioeconomic status. As the bilingual population in American schools continues to grow, it is important that educators and therapists understand how children from diverse linguistic backgrounds learn and perform on phonological awareness tasks, and if word density or other variables could be manipulated to impact students' performance. Additionally, less is known about what factors may be impacting the performance of students from low socioeconomic status in comparison to their peers from other backgrounds. Further research should strive to include and represent these children.

References

- Bialystok, E. (1988). Levels of bilingualism and levels of linguistic awareness. *Developmental Psychology, 24*, 560-567.
- Bialystok, E., & Martin, M. M. (2004). Attention and Inhibition in Bilingual Children: Evidence from the Dimensional Change Card Sort Task. *Developmental Science, 7*(3), 325-339.
- Branum-Martin, L., Tao, S., Garnaat, S., Bunta, F., & Francis, D. J. (2012). Meta-Analysis of Bilingual Phonological Awareness: Language, Age, and Psycholinguistic Grain Size. *Journal of Educational Psychology, 104*, 932-944.
- Brownell, R. (2001). Expressive one-word picture vocabulary test (Spanish-bilingual edition, manual). Novato, CA: Academic Therapy Publications.
- Dalbor, J. B. (1997). *Spanish pronunciation: theory and practice* (3rd ed.). Fort Worth, TX: Harcourt Brace College Publishers.
- Davis, C. J., & Perea, M. (2005). BuscaPalabras: A program for deriving orthographic and phonological neighborhood statistics and other psycholinguistic indices in Spanish. *Behavior Research Methods, 37*(4), 665-671.
- Durgunoglu, A. Y., Nagy, W. E., & Hacin-Bhatt, B. J. (1993). Cross-Language Transfer of Phonological Awareness. *Journal of Educational Psychology, 85*, 453-465.
- Ehrler, D. J., & McGhee, R. L. (2008). Primary test of nonverbal intelligence (PTONI). *Texas: Pro-Ed*.
- Gutierrez-Clellen, V. F., & Kreiter, J. (2003). Understanding Child Bilingual Acquisition Using Parent and Teacher Reports. *Applied Psycholinguistics, 24*, 267-288.

Hadley, P. A. (1998). Language sampling protocols for eliciting text-level discourse.

Language, Speech, and Hearing Services in Schools, 29, 132-147.

Kirsch, I. S., Jungeblut, A., Jenkins, L., & Kolstad, A. (2002). *Adult literacy in America: A first look at the findings of the National Adult Literacy Survey* (Stock No. 065-000-00588-3). Washington, DC: U.S. Government Printing Office.

Lund, E., Werfel, K. L., & Schuele, C. M. (2014). Phonological Awareness and Vocabulary Performance of Monolingual and Bilingual Preschool Children with Hearing Loss. *Child Language Teaching and Therapy*, published online 22 April 2014.

<http://clt.sagepub.com/content/early/2014/04/22/0265659014531261>

Moe, A. J., Hopkins, K. J., & Rush, R. T. (1982). The vocabulary of first grade children. Springfield, IL: Thomas.

Morton, J. B., & Harper, S. N. (2007). What did Simon say? Revisiting the bilingual advantage. *Developmental Science, 10*(6), 719-726.

National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction* (NIH Publication No. 00-4769). Washington, DC: U.S. Government Printing Office.

Rolla San Francisco, A., Carlo, M., August, D., & Snow, C. E. (2006). The role of language of instruction and vocabulary in the English phonological awareness of Spanish-English bilingual children. *Applied Psycholinguistics, 27*, 229-249.

Schuele, C. M., & Boudreau, D. (2008). Phonological awareness intervention: beyond the basics. *Journal of Speech, Language, and Hearing Research, 39*, 3-20.

Storkel, H. L. & Hoover, J. R. (2010). An on-line calculator to compute phonotactic probability and neighborhood density based on child corpora of spoken American English. *Behavior Research Methods*, 42(2), 497-506.

Walley, A. C., Metsala, J. L., & Garlock, V. M. (2003). Spoken vocabulary growth: Its role in the development of phoneme awareness and early reading ability. *Reading and Writing*, 16, 5-20.

Appendix A

Teacher Language Survey

Name of Child _____ School/grade _____

Age of Child _____ Teacher _____

Use refers to how much the child uses each language. Circle the appropriate rank for each language (Spanish and English) for all the questions.

- 0 Never uses the indicated language. Never hears it.
- 1 Never uses the indicated language. Hears it very little.
- 2 Uses the indicated language a little. Hears it sometimes.
- 3 Uses the indicated language sometimes. Hears it most of the time.
- 4 Uses the indicated language all of the time. Hears it all of the time.

DK Don't know

Use												
Questions	Spanish					English						
1. Speaks with you in class	DK	0	1	2	3	4	DK	0	1	2	3	4
2. Speaks with aides or other teachers	DK	0	1	2	3	4	DK	0	1	2	3	4
3. Speaks with classmates	DK	0	1	2	3	4	DK	0	1	2	3	4

Proficiency refers to how well the child speaks each language. Circle the appropriate rank for each language (Spanish and English).

- 0 Cannot speak the indicated language, has a few words or phrases, cannot produce sentences, only understands a few words.
- 1 Cannot speak the indicated language, has a few words or phrases, understands the general idea of what is being said.
- 2 Limited proficiency with grammatical errors, limited vocabulary, understands the general idea of what is being said.
- 3 Good proficiency with some grammatical errors, some social and academic vocabulary, understands most of what is said.
- 4 Nativelike proficiency with few grammatical errors, good vocabulary, understands most of what is said.

DK Don't know

Proficiency												
Questions	Spanish					English						
1. Speaks with you in class	DK	0	1	2	3	4	DK	0	1	2	3	4

- Do you think the child has language problems? YES NO
- Do you think the child has academic or learning problems? YES NO
- Do you think the child has behavioral or social problems? YES NO
- Do you think the child has physical problems? YES NO

On the continuum, circle the percentage of time that the child is exposed to each language at school:

English	100%	80%	60%	50%	40%	20%	0%
Spanish	0%	20%	40%	50%	60%	80%	100%

Gutierrez-Clellen, V. F., & Kreiter, J. (2003). Understanding Child Bilingual Acquisition Using Parent and Teacher Reports. *Applied Psycholinguistics*, 24, 267-288.

Appendix B

Parent Language Survey in English

Today's date: _____

Your child's age: _____

Your child's grade in school: _____

Your relationship to the child: Mother Father Other

How many people live at home with your child? _____

Do other people think your child is difficult to understand because of articulation?

Yes No

Are you worried about how your child talks?

Yes No

In comparison with other children of the same age, does your child have trouble understanding questions?

Yes No

Have any of your child's family members (including siblings, parents, aunts/uncles, or cousins) had problems learning language?

Yes No

Have any of your child's family members (including siblings, parents, aunts/uncles, or cousins) had expressing ideas with words?

Yes No

Have any of your child's family members (including siblings, parents, aunts/uncles, or cousins) had problems understanding questions?

Yes No

Have any of your child's family members (including siblings, parents, aunts/uncles, or cousins) had difficulties with learning at school?

Yes No

Have any of your child's family members (including siblings, parents, aunts/uncles, or cousins) had problems learning to read?

Yes

No

Have any of your child's family members (including siblings, parents, aunts/uncles, or cousins) had speech and language therapy?

Yes

No

When your child was 0 to 1 years of age, what languages did he or she hear at home?

Spanish

English

Both

Other

At daycare?

Spanish

English

Both

Other

When your child was 1 to 2 years of age, what languages did he or she hear at home?

Spanish

English

Both

Other

At daycare?

Spanish

English

Both

Other

When your child was 2 to 3 years of age, what languages did he or she hear at home?

Spanish

English

Both

Other

At daycare?

Spanish

English

Both

Other

When your child was 3 to 4 years of age, what languages did he or she hear at home?

Spanish

English

Both

Other

At daycare/school?

Spanish

English

Both

Other

When your child was 4 to 5 years of age, what languages did he or she hear at home?

Spanish

English

Both

Other

At daycare/school?

Spanish	English	Both	Other
---------	---------	------	-------

We know that people speak different types of Spanish (for example, Mexican Spanish, Cuban Spanish, Puerto Rican Spanish). What would you call your type of Spanish?

When your child is not at school or asleep, how many hours does he or she spend at home?

What language do you speak to your child in at home?

Spanish	English	Both	Other
---------	---------	------	-------

What language do your child's siblings use at home?

Spanish	English	Both	Other
---------	---------	------	-------

What language does your child speak in at home?

Spanish	English	Both	Other
---------	---------	------	-------

What language does your child use to read books at home?

Spanish	English	Both	Other
---------	---------	------	-------

What language does your child use to watch TV at home?

Spanish	English	Both	Other
---------	---------	------	-------

If your child does not spend time at home after school, where does he or she go?

What language does your child use there?

Spanish	English	Both	Other
---------	---------	------	-------

Survey adapted from: Gutierrez-Clellen, V. F., & Kreiter, J. (2003). Understanding Child Bilingual Acquisition Using Parent and Teacher Reports. *Applied Psycholinguistics*, 24, 267-288.

Appendix C

Recording Sheets for Experimental Tasks

Child Code:

Examiner:

Sound Matching Task: Data Sheet

Group	Target Word	Correct?	Response
HD English/ HD Spanish	Key		
	Car		
	Mama		
	Nose		
	Bear		
	Ten		
HD English/ LD Spanish	Boat		
	Duck		
	Night		
	Cake		
	Chair		
	Red		
LD English/ HD Spanish	Pizza		
	Photo		
	Zero		
	Nacho		
	Snow		
	Coffee		
LD English/ LD Spanish	Girl		
	Monkey		
	Paper		
	Table		
	Chicken		
	Apple		

Child Code:

Examiner:

Sound Identification Task: Data Sheet

Group	Word	Child Response
HD English/ HD Spanish		
HD English/ LD Spanish		
LD English/ HD Spanish		
LD English/ LD Spanish		

Child code:

Examiner:

Sound Blending Task

Group	Word	Child Response
HD English/ HD Spanish		
HD English/ LD Spanish		
LD English/ HD Spanish		
LD English/ LD Spanish		

ABSTRACT

ASSESSING THE LEXICAL RESTRUCTURING MODEL IN BILINGUAL STUDENTS

by Christine McClary, M.S., 2016
Department of Communication Sciences and Disorders
Texas Christian University

Emily Lund, Ph.D., CCC/SLP, Assistant Professor of Communication Sciences and Disorders

The purpose of this study was to investigate the relation between bilingual children's lexical knowledge and the development of phonological awareness, a critical pre-literacy skill. This project tested whether the widely reported "bilingual advantage" in phonological awareness relates to the model proposed by the Lexical Restructuring Hypothesis. The Lexical Restructuring Hypothesis proposes that phonological awareness develops as children's vocabularies grow. Twelve bilingual and ten monolingual children (n = 22, age 5;8-7;6) participated in phonological awareness tasks. Tasks included words that were either high or low neighborhood density relative to English and Spanish lexicons. The Lexical Restructuring Hypothesis was tested by comparing children's performance across these word types. Findings indicated a relation between vocabulary knowledge and performance on phonological awareness tasks, regardless of group or word type. On one phonological awareness task, bilingual children also displayed significantly higher performance than monolingual children on words that had high neighborhood density in Spanish and low neighborhood density in English. These findings suggest that bilingual children may demonstrate an advantage over their monolingual peers due to their lexical knowledge in two languages. This study provides initial support for the Lexical Restructuring Hypothesis as an explanation of phonological awareness development.