



2015

Academic Achievement of Latino Emerging Adults: The Role of Language Brokering, Executive Functions, and Language Proficiency

Valerie Christina Flores
Loyola University Chicago

Follow this and additional works at: https://ecommons.luc.edu/luc_diss

 Part of the [Developmental Psychology Commons](#)

Recommended Citation

Flores, Valerie Christina, "Academic Achievement of Latino Emerging Adults: The Role of Language Brokering, Executive Functions, and Language Proficiency" (2015). *Dissertations*. 1636.
https://ecommons.luc.edu/luc_diss/1636

This Dissertation is brought to you for free and open access by the Theses and Dissertations at Loyola eCommons. It has been accepted for inclusion in Dissertations by an authorized administrator of Loyola eCommons. For more information, please contact ecommons@luc.edu.



This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 3.0 License](#).
Copyright © 2015 Valerie Christina Flores

LOYOLA UNIVERSITY CHICAGO

ACADEMIC ACHIEVEMENT OF LATINO EMERGING ADULTS:
THE ROLE OF LANGUAGE BROKERING, EXECUTIVE FUNCTIONS, AND
LANGUAGE PROFICIENCY

A DISSERTATION SUBMITTED TO
THE FACULTY OF THE GRADUATE SCHOOL
IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

PROGRAM IN DEVELOPMENTAL PSYCHOLOGY

BY

VALERIE C. FLORES

CHICAGO, IL

AUGUST 2015

Copyright by Valerie C. Flores, 2015
All rights reserved.

ACKNOWLEDGMENTS

At this time, I would like to thank Christine Li-Grining, PhD, Robert G. Morrison, PhD, Rebecca Silton, PhD, and Perla Gamez, PhD for their academic support and continued interest in this research endeavor. Their guidance has been invaluable throughout this journey. I would like to thank my family and friends for their unconditional love and support of my academic aspirations. In particular, I would like to thank my parents, Sal and Katie Flores, for their unwavering support and encouragement over the course of my graduate school career. My siblings, Elena, Marisa and Sam have kept in good humor, with a happy heart! Furthermore, I would like to thank the following friends for their emotional support and encouragement during the preparation of my dissertation, without which I would not have survived it in a similar fashion: Arie Zakaryan, Nicole Leitz Garcia, Laura Stockdale, Vanessa Rainey, Catherine Lee, Kelly Haas, and Katie O'Toole. A special thanks to Todd Lamb for being my rock, giving my life balance and joy during the most trying moments on this journey, and helping me to keep everything in perspective with a healthy dose of optimism. I would also like to thank all of the participants in this study, as their participation made this dissertation possible. Lastly, I thank God for this opportunity as well as the strength and courage that I was supplied with to persevere through the darkest times. Thank you all.

TABLE OF CONTENTS

ACKNOWLEDGMENTS	iii
LIST OF TABLES	vii
LIST OF FIGURES	ix
ABSTRACT	x
CHAPTER ONE: INTRODUCTION	1
Latino Emerging Adults in the University Setting	4
Overview of Present Study	6
Theoretical Framework	9
CHAPTER TWO: REVIEW OF RELEVANT LITERATURE	11
Language Brokering	11
Language brokering and academic achievement	12
Language brokering and executive functions	14
The Development of Executive Functions	16
Strengths in inhibition and shifting	18
Executive functions and academic achievement	20
Language Proficiency	21
Moderating role of language proficiency	24
Research Questions and Hypotheses	25
Exploring language brokering across developmental periods	28
CHAPTER THREE: METHOD	32
Participants	32
Procedure	33
Measures	34
Language brokering	34
Executive functions	36
Academic achievement	38
Language fluency	39
Background characteristics	41
CHAPTER FOUR: RESULTS	42
Descriptive Statistics	42
Bivariate associations among the main variables of interest	48
Research Question #1: Is Language Brokering Associated with Academic Achievement?	54
Research Question #2: Is Language Brokering Linked with Executive Functions?	56

Research Question #3: Are Executive Functions Related to Academic Performance?	59
Research Question #4: Do Executive Functions Mediate the Relation between Language Brokering Status and Academic Success?	65
Research Question #5: Does English Language Proficiency Moderate the Link between Executive Functions and Academic Achievement?	69
Research Question #6: The Full Moderated Mediation Model Exploring language brokering across developmental periods	73
CHAPTER FIVE: DISCUSSION	75
Contributions	75
Descriptive Portrait of Bilingual College Students	76
Language Brokering and Academic Achievement	79
Language Brokering and Executive Functions	83
Executive Functions and Academic Achievement	86
Mediation and Moderated Mediation Models	88
Mediation	88
Moderated mediation	89
Exploring Links with Patterns of Brokering	90
Limitations	91
Conclusion	93
APPENDIX A: TYPES OF LANGUAGE BROKERS AND PERIODS OF BROKERING	96
APPENDIX B: RESEARCH QUESTIONS IN RELATION TO AVAILABLE MEASURES	98
APPENDIX C: LANGUAGE BROKERING QUESTIONNAIRE	102
APPENDIX D: BEHAVIORAL RATING INVENTORY OF EXECUTIVE FUNCTIONS- ADULT VERSION (BRIEF-A) QUESTIONNAIRE	105
APPENDIX E: SAMPLE STIMULUS FROM THE NIH FLANKER INHIBITORY CONTROL AND ATTENTION TEST	107
APPENDIX F: SAMPLE STIMULUS FROM THE NIH DIMENSIONAL CHANGE CARD SORT TEST	109
APPENDIX G: SAMPLE STIMULUS FROM THE NIH LIST SORTING WORKING MEMORY TEST	111
APPENDIX H: SAMPLE STIMULUS FROM THE NIH PICTURE VOCABULARY TEST	113

REFERENCE LIST	115
VITA	129

LIST OF TABLES

Table 1. Criteria for Language Brokers and Non-brokers based on Frequency of Translating Items for Various People, in Different Contexts	34
Table 2. Descriptive Table of Bilingual Survey Participants' Other Language in Conjunction with English ($N = 430$)	43
Table 3. Background Characteristics of the Full Survey Sample ($N = 430$), Examining Differences Across Latino Heritage and Broker Status	45
Table 4. Background Characteristics of the NIH Subset of Latino Bilinguals ($n = 83$), Examining Differences Depending on Broker Status	46
Table 5. Descriptives of Key Variables for the Full Survey Sample ($N = 430$), Depending on Latino Heritage and Broker Status	48
Table 6. Descriptives of Key Variables for the Full Survey Sample, Depending on Latino Heritage and Broker Status	50
Table 7. Descriptives of Key Variables for the NIH Subset of Latino Bilinguals ($n = 83$), Depending on Broker Status	51
Table 8. Descriptives of the NIH Subset of Latino Bilinguals, Examining Differences in Key Variable Depending on Broker Status	52
Table 9. Bivariate Correlations for Variables of Interest	53
Table 10. Regression Models Testing the Link between Language Broker Status and Academic Achievement	55
Table 11. Regression Models Linking Language Broker Status and Executive Functions	58
Table 12. Regression Models Linking Executive Functions with Academic Achievement, Depending on Current Broker Status	61
Table 13. Regression Models Linking Executive Functions with Academic Achievement, Depending on Ever Broker Status	64

Table 14. Effect of Current Language Broker Status on the Academic Achievement of Latino students, as Mediated by Executive Functions X English Language Proficiency

73

LIST OF FIGURES

Figure 1. Language brokering predicting emerging adults' academic success	25
Figure 2. Language brokering predicting emerging adults' executive functions	26
Figure 3. Executive functions predicting emerging adults' academic achievement	26
Figure 4. Emerging adults' executive functions mediating the link between language brokering and academic achievement	27
Figure 5. English language proficiency moderating the link between emerging adults' executive functions and academic achievement	27
Figure 6. Proposed full model of emerging adults' language brokering and academic achievement	28
Figure 7. Comparing the distribution of annual household income for Latino brokers and non-brokers ($N = 167$)	47
Figure 8. Comparing the distribution of annual household income for non-Latino brokers and non-brokers ($N = 263$)	48
Figure 9. Trending indirect effect of non-Latinos' current language brokering status on high school ACT scores, as mediated by the shifting aspect of executive functions	68
Figure 10. The simple slopes of Latino ever brokers' English language proficiency by inhibiting skills predicting college GPA	71

ABSTRACT

A vast literature has examined bilinguals' strengths in executive functions (EFs) without considering how language brokering, or translating frequently for family and friends, relates to such advantages in EFs. At the same time, Latinos students – many of whom are bilingual – are the largest minority group attending college today in the U.S., despite being less likely to receive a bachelor's degree. The overarching goal of the present study was to explore whether language brokering practices among Latino emerging adults led to better cognitive skills and ultimately greater academic achievement in college. Data were collected from multiple cohorts of bilingual undergraduates ($N = 430$), who released their academic records and reported on their language brokering practices, EFs, and language proficiency. A subsample of Latino bilinguals ($n = 83$) completed behavioral tasks measuring EFs and language proficiency. Although the findings were largely null, there were exceptions. For instance, results from OLS regression models revealed that Latino bilinguals who did not broker had significantly better ACT scores, and brokering posed as a risk factor to the shifting component of EFs. All three aspects of EFs were linked to better academic scores. However, bootstrapped mediation and moderated mediation models were not significant. This dissertation concludes with future directions for this line of research, particularly in regards to measurement and analyses, which may uncover hidden benefits of language brokering.

CHAPTER ONE

INTRODUCTION

Language brokering is a term used to refer to the practice of translating or interpreting conversations or materials for family members or other individuals that do not speak the host culture's language (McQuillan & Tse, 1995; Morales & Hansen, 2005; Orellana, 2009; Tse, 1995a; 1995b). Language brokers refers to bilingual individuals who frequently translate sophisticated materials, such as bank statements, bills, or legal documents, that require them to comprehend adult-level material while also tailoring material to meet cultural needs (Morales & Hanson, 2005; Tse, 1995a). For at least a decade, this literature has grown and used other terminology such as "para-phrasing" (Orellana, Reynolds, Dorner, & Meza, 2003) or "family interpreting" (Valdés, 2003) to capture the idea behind translating frequently for family and friends; however, for the purposes of this study the term language brokering will be used.

Orellana's (2009) qualitative research on language brokers has intimately described the lives of child language brokers from middle childhood through late adolescence who reside in Chicago. To their parents, these children are considered to be "la mano derecha", or the right hand, of their families. Responsibilities for young translators in middle childhood may include: managing incoming and outgoing phone calls, translating mail, applying for parents' credit line or unemployment, and being the voice of the family in public arenas such as school, hospitals, restaurants, and stores.

Orellana (2009) notes that as children grow into adolescents their language brokering responsibilities often expand with their burgeoning knowledge and capabilities. For example, at 12 years old, *Nova*, helped negotiate the purchase of a home computer for his family, with his own prompting. In a similar way *Cindy*, age 14, did not like being treated like a child by the adults over the phone because part of her language brokering responsibilities included managing household expenses, stating, “I write the bills. I write the checks” (Orellana, 2009, p. 181). In high school, *Junior* expressed that he translated even more than he did as a child because “there’s more to do around the house” in this new information age, such as helping his family choose a new cable and internet service provider (Orellana, 2009, p. 1395). In short, Orellana (2009) found that language brokering frequently continued beyond high school and into emerging adulthood. In particular, *Luz* is a language broker who Orellana followed into emerging adulthood who attended a prestigious college in the Chicagoland area. She often commuted by train for three hours in one direction to attend college courses, while also making sure to be home in time to translate doctor appointments for her mother who suffered from diabetes. After four years, she received her bachelor’s degree and teaches high school social studies. *Luz* hopes to one day help buy her family their first home.

The present study built on Orellana’s qualitative work (Orellana, 2003; 2009; Orellana, Martinez, Lee, & Montano, 2013; Reynolds, Dorner, & Orellana, 2011; Reynolds & Orellana, 2009) and expanded it by measuring such practices quantitatively. Furthermore, the present study set out to advance knowledge regarding those bilinguals who continue to language broker into emerging adulthood. Emerging adulthood is a

distinct period of development, spanning from ages 18 to 25, marked by role experimentation, instability and exploration of possible life directions in regards to love, work and worldviews (Arnett, 2000; 2007; Erikson, 1968). In comparison to adolescence or young adulthood, it is demographically diverse without any enduring norms, such as school enrollment or marriage, being common among the majority (Arnett, 2000; 2007). For example, 95% of adolescents live at home and attend school, with the majority of them unmarried and without children (Arnett, 2000; Hamilton, Martin, & Ventura, 2013); in contrast, approximately three-quarters of adults in their thirties have married, become parents, entered stable employment, and less than 10% of them still attend school (Arnett, 2000; 2007; Cohn, Passel, Wang, & Livingston, 2011). As emerging adults, language brokers may or may not still live at home to help assist their family, however, technology today (e.g., internet, smart phones) makes emerging adults more accessible to their non-English speaking family members near or far. Therefore, language brokering is likely to continue beyond adolescence.

The adult-like responsibilities held by young language brokers may concern those who worry that translating critical conversations and materials may add undue pressure or burden to language brokers, regardless of age. This view originated from a theory within clinical psychology called family systems theory (Minuchin, 1974), yet the father of this theory, Salvador Minuchin, argued that taking on additional household responsibilities did not suggest a role reversal was present among parents and their children:

The allocation of parental power to a child is a natural arrangement in large families, single-parent families, or in families where both parents work. The system can function well. The younger children are cared for and the parental child can develop responsibility, competence, and autonomy beyond his years. (Minuchin, 1974, p. 97)

Certainly the households of language brokers function differently from those of mainstream Americans, yet this experience may afford children and adolescents earlier opportunities to be autonomous and independent than is custom in a given culture. Some studies even suggest that language brokering can bolster children and adolescents' confidence and academic achievement (Acoach & Webb, 2004; Buriel, Perez, Terri, Chavez, & Moran, 1998; Walsh, 2006). Furthermore, language brokering for emerging adults may prove less burdensome and more beneficial to development, as such responsibilities are welcomed by youth who are transitioning into more purposeful, adult-like roles. Overall, it is possible that language brokering supplies both children and emerging adults with a unique learning experience that fosters their cognitive skills and manifests in greater academic success.

Latino Emerging Adults in the University Setting

Latino families in the U.S. often call upon their children, even as young adults, to translate materials or conversations for them in an effort to overcome a language barrier. In general, the Latino population in the U.S. has grown from 35.3 million in 2000 to 50.5 million in 2010, accounting for more than half of the total population growth in the U.S. (U.S. Bureau of Labor Statistics, 2010). This Latino population is also very young, with 26% of children under 5-years-old identifying as Latino (U.S. Census Bureau, 2011), and by 2050 it is projected that there will be more Latino school-aged children than non-Latino children in the public school system (Fry & Gonzales, 2008). At the same time, it is an exciting time in education for Latino youth who are less likely than before to drop out of high school and, in turn, are attending college in droves. For instance, in the last

few decades the high school dropout rate of Latino students was reduced from 32% in 1990 to 14% in 2011 (U.S. Department of Education, 2013). Furthermore, 2012 was the first year that 7 out of 10 (69%) Latinos enrolled in college, surpassing the 67% of white, non-Latinos pursuing college (Fry & Taylor, 2013). Today, with over 2 million students enrolled in college, Latinos now comprise the largest minority population on college campuses as 16.5% of the population (Fry & Lopez, 2012). This may be due, in part, to the emphasis Latino families place on higher education, as 88% of Latino youth report it is necessary to attend college in order to be successful (Pew Hispanic Center, 2009), compared to the 74% of all Americans who believe college is necessary (Taylor, Kochlar, Morin, Wang, Dockterman, & Medina, 2009). Latinos' growing presence on college campuses warrants greater attention.

Yet, there are still some shortcomings that Latino students experience in higher education. For example, Latino students are less likely to enroll in a four-year college, less likely to enroll full time, and less likely to complete a bachelor's degree (Fry & Taylor, 2013). Latinos (60%) are also less likely than non-Latino whites (85%) to attend a selective college that involves a more rigorous admissions process (Bozick, Lauff, & Wirt, 2007). This suggests that while the desire to attend college is present, Latinos' route to academic success in higher education is vulnerable to difficulties, in large part due to their lower socioeconomic status (SES) on average. Not only may Latinos come from households with a lower household income, but it is more likely that Latino students do not have the same academic support that their peers have at home to bolster academic their growth.

As emerging adults, Latino college students have acquired a multitude of skills that enable them to act as agents of their own academic success (Bronfenbrenner, 2000). However, students' academic load and content in college becomes increasingly more challenging (Tseng, 2004), making it common for intelligent, enthusiastic high school students to enter the university setting only to struggle and fail (Perry, Hladkyg, Pekrun, & Pelletier, 2001). For this reason, it is important to examine the heterogeneity of Latino emerging adults attending college and specific characteristics that lead to their academic success. In particular, the proposed study will explore the differences and strengths among Latino emerging adults who language broker and those Latino emerging adults who are bilingual but do not language broker. Past research evaluating the cognitive and academic development of minority children, including Latinos, has often used a deficit model approach (Cabrera, 2013). That is, minorities have been compared to the majority population in terms of their shortcomings rather than their strengths. Yet, Latino emerging adults who speak a second language fluently have the advantage of communicating ideas to a broader community, and those who switch between languages on a regular basis may possess cognitive advantages that surpass advantages associated with being merely bilingual.

Overview of Present Study

Broadly speaking, the present study is focused on the cognitive development of Latino emerging adults who are bilingual. In particular, there are three aspects of cognition this investigation centers around: higher order processes, language skills, and the application of such capacities in an academic setting. Higher order processes are

important because they enable college students to persist in tasks, suppress dominant responses that may be inaccurate, and flexibly move between tasks or mindsets. In essence, higher order processes facilitate learning (Best & Miller, 2010; Best, Miller, & Naglieri, 2011; Miyake & Friedman, 2012). Next, this study is interested two aspects of language skills: Latinos' language experiences and proficiency. Certain linguistic experiences, such as daily translating materials or conversations, may lead to greater heterogeneity among bilingual individuals, such that those who translate frequently tend to have more efficient cognitive processing (Best, Miller, & Naglieri, 2011; Bialystok, 2009; Bialystok, et al., 2005; Dorner, Orellana, & Li-Grining, 2007; Orellana, 2003). Furthermore, language proficiency is also of interest to this study, because in general bilingual individuals tend to lag behind in language development (Bialystok & Feng, 2011); therefore, acquiring adequate language proficiency is critical for bilingual individuals' academic performance (Bumgarner, Martin, & Brooks-Gunn, 2013; Zeegers, 2004). Both higher order processes and language skills of bilingual emerging adults are relevant to their academic performance in the higher education. Thus, the current investigation aims to test the degree to which these aspects of Latinos' cognition predict school success.

The proposed study views language brokering as a practice that augments particular cognitive skills of bilingual emerging adults to bring about academic success. In particular, switching between languages on a daily basis provides language brokers with a rare opportunity to develop and ameliorate their executive functions (Bialystok, 2009; 2011). In translating conversations or documents, language brokers consistently

shift between languages and must actively inhibit the language not currently in use.

Therefore, it is likely that language brokers explicitly develop their cognitive flexibility and inhibition skills to become more efficient at translating materials, and such efficiency in processing information may extend beyond the context of language brokering.

Several studies have linked EFs to academic achievement (Best, Miller, & Jones, 2009; Bull, Espe, & Wiebe, 2008; St. Clair-Thompson & Gathercole, 2006). Students with stronger EFs are able to mentally hold and manipulate relevant information, focus and persist in a task, select a correct though less obvious solution, and switch flexibly between tasks or mindsets. However, research also shows that learning two languages can complicate bilingual individuals' ability to succeed academically (Ardasheva, Tretter, & Kinny, 2012; Bumgarner, Martin, & Brooks-Gunn, 2013). Language proficiency may act as a moderator for academic success because the working memory, or updating capacity, of students less proficient in English may be too burdened with a large cognitive load, for better EFs to bring about academic success (Paas, Touvinen, Tabbers, & Van Gerven, 2003). In turn, the present study recognizes that language brokers' predicted higher EFs may only manifest as school success when they have sufficient English language proficiency (Cummins, 1979; 2000). In sum, the academic achievement of language brokers may be explained by the interaction between EFs and English language proficiency.

In general, the overall goals of this study are to first explore whether a potential link between language brokering and academic achievement is explained by Latino emerging adults' executive functions (EFs). Second, this investigation will also examine

whether this mediating pathway from Latinos' language brokering to their academic success depends on the quality of their English language proficiency.

Theoretical Framework

Guided by these aims, the proposed study will be rooted in Vygotsky's sociocultural theory which views human development as taking place when individuals interact with the social world around them (Vygotsky, 1978). Sociocultural theory emphasizes the idea of apprenticeship as a means to this development, which is most apparent in Vygotsky's concept known as the zone of proximal development, in which an expert aids a novice in acquiring a particular skill. This help is most effective when the expert scaffolds, or provides supportive learning experiences.

An assumption of this theory is that children are the novices who learn skills from older children or adults who are experts in a given skill. However, in the case of language brokering, children tend to take a leadership role, allowing parents or other adults to accomplish a particular task, such as paying a bill, which could not otherwise be accomplished without the assistance of their children. Orellana (2009) proposes that children can be the experts in a learning situation where their parents or other adults are novices. Orellana further expands sociocultural theory by suggesting that it is possible for parents and their language brokering children to mutually scaffold one another in an effort to advance their skills together. For example, language brokers' may help parents to build up their English skills (e.g., vocabulary, grammar, phonemes), and in turn, parents may help their language brokering children or emerging adults to comprehend larger societal structures (e.g., social security, jury duty), may expand their native

vocabulary, and may ultimately augment their executive functions with the daily practice of switching between languages. In regards to the academic success of Latino emerging adults, sociocultural theory views greater achievement as being explained in part by individuals' cumulative interactions with the social world around them, where one such salient experience is language brokering for some bilinguals.

CHAPTER TWO

REVIEW OF RELEVANT LITERATURE

Language Brokering

Language brokering is a common phenomenon among immigrant families. Immigrant parents may experience a lot of stress in their transition into American life, as they must become familiar with a new environment, culture, and to some extent a new language (Morales & Hanson, 2005). At the same time, children of immigrants tend to interact with the host culture and language to a greater extent compared to their parents (Weisskirch, Kim, Zamboanga, Schwartz, Bersamin, & Umaña-Taylor, 2011), in part due to the fact that they may be the only ones in the household educated by the dominant culture. Children also adapt to new cultures more rapidly than their parents (Suárez-Orozco & Suárez-Orozco, 2009). As previously mentioned, there is qualitative evidence that brokering responsibilities persist beyond adolescence into emerging adulthood (Orellana, 2009; Weisskirch et al., 2011), as language brokers' skills improve and brokers are able to assist their families with more complicated materials. Therefore, in an effort to alleviate the stress of parents' acculturation process, they continue to lean on their children through emerging adulthood to help navigate the host culture. In many ways, this language brokering functions as a bridge connecting two languages as well as two cultures.

The developmental course appears to begin in early childhood and continue

through emerging adulthood. By ages 7- to 8-years-old, children have developed sufficient metalinguistic skills, allowing for reflection and manipulation of language (Edwards & Kirkpatrick, 1999). In turn, children may begin translating words, materials, and conversations for non-English speaking family members and friends, given that they possess sufficient language proficiency in both languages. Empirical evidence suggests that language brokering tends to occur among children as young as 8- to 9-years-old (McQuillan & Tse, 1995). While existing literature tends to focus on child and adolescent brokers (Morales & Hanson, 2005), there is no evidence suggesting that language brokering ends after adolescence (Orellana, 2009; Weisskirch et al., 2011). As such, this dissertation seeks to extend the existing literature by focusing on language brokers who are emerging adults. More specifically, this dissertation centers on understanding the academic skills of older language brokers.

Language brokering and academic achievement. There are four studies linking language brokering with academic achievement, which are rather limited and inconclusive. These studies have been limited to investigating the academic performance of children in middle childhood and adolescence. For example, Dorner and colleagues (2007) revealed a positive link between fifth- and sixth-grader frequency of language brokering and their standardized reading tests, after controlling for prior school success. This suggests that academic gains for language brokers may be present as early as age 11. A second study also found positive correlations between children's language brokering and their achievement in reading and math standardized tests (Orellana, 2003). Buriel and colleagues (1998) investigated various links predicting 9th- and 10th-grade Latino

language brokers' self-reported academic performance. Findings revealed that adolescents' frequency of language brokering, biculturalism, and academic self-efficacy were positively associated with their academic achievement. Lastly, Acoach and Webb (2004) aimed to replicate the work of Buriel and colleagues (1998) with Latino students in junior high and seniors in high school. For younger adolescents, language brokering was indirectly related to students' self-reported GPA in a positive direction via their level of biculturalism, whereas high school students' academic self-efficacy explained the link between brokering frequency and self-reported GPA. Taken together, these four studies have demonstrated that young students' frequency of brokering is associated with different aspects of their academic performance from late primary school through junior high and high school.

Other research has yielded null findings in examining the relation between language brokering and academic achievement. Tse (1995a) found no association among a small sample of Latino adolescents' brokering practices and academic achievement. However, this same study also suggested that traditional assessment tools may fail to capture the true language skills of language minority students, who were also capable of interpreting documents that far exceeded their measured levels of language proficiency. Additionally, past research has examined adolescents' language brokering and academic success using self-reported GPA (Acoach & Webb, 2004; Buriel et al., 1998).

The present study builds on these findings by investigating the direct relation between language brokering experiences of emerging adults and their academic achievement. To the extent that brokering provides individuals with more opportunities

to practice and to develop valuable cognitive skills, language brokering may be useful to academic achievement. Additionally, this will be the first study of its kind to explore the language brokers' academic performance beyond high school and during emerging adulthood, as empirical evidence points to continued language brokering beyond adolescence (Orellana, 2009; Weisskirch et al., 2011).

Language brokering and executive functions. One compelling explanation for positive links between language brokering and academic achievement during emerging adulthood is that brokers may possess better executive functions (EFs). EFs are defined as those higher order cognitive processes responsible for goal-directed behavior that are managed by activity in the prefrontal cortex (Best & Miller, 2010). A vast body of literature suggests that speaking two languages fluently leads to an advantage in executive functions (EFs) across development (Bialystok, 2006; 2009; Bialystok et al., 2004; Martin-Rhee & Bialystok, 2009; Costa, Hernandez, & Sebastian-Galles, 2008). The rationale behind these findings is such that bilingual individuals are accustomed to inhibiting one language in order to use a target language (Bialystok, 2009; Bialystok, Craik & Luk, 2008; Carlson & Meltzoff, 2008; Kovács & Mehler, 2009). Extant research looking at bilinguals' executive functions suggests that both languages remain active in the brain of fluent bilinguals when they are using only one of the languages (Kroll, Bobb, & Wodniecka, 2006; Kaushanskaya & Marian, 2007). This means that being bilingual poses a constant dilemma in the network of EFs, which challenges one to select the appropriate wording that corresponds with the language presently in use (Bialystok, 2009). As such, language brokers' practice of shifting between languages with greater

frequency might help facilitate the development of greater executive functions, leading to better academic performance.

Given the rationale that frequent switching between languages leads to better EFs among bilinguals, it is surprising that this literature has not considered that the practice of language brokering, which involves shifting between languages with greater frequency, would lead to superior EFs. Indeed, those bilingual individuals who language broker for their families tend to shift between languages more regularly compared to non-brokering bilinguals (Dorner, Orellana, & Li-Grining, 2007; Morales, & Hanson, 2005; Orellana, 2009; Weisskirch et al., 2011). The practice of language brokering could very well contribute to greater variance, or heterogeneity, in EFs among bilinguals. In turn, it is plausible that this special population of bilinguals – language brokers – may demonstrate superior levels of EFs in comparison to non-brokering bilinguals. Nevertheless, past research has not investigated whether a language brokering advantage exists. Thus, the current study seeks to contribute to this literature by examining the association between Latino bilinguals' brokering and executive functions.

In an effort to test whether language brokering is related to better EFs, the current study is grounded in a conceptual framework of EFs that consists of three distinct yet related capacities: *updating* (i.e., ability to maintain and manipulate information), *inhibiting* (i.e., ability to control and modulate behavior), and *shifting* (i.e., ability to flexibly switch between mental tasks; Miyake & Friedman, 2012). Embedded in this theory is Miyake and Friedman's (2012) unity and diversity principle that views these three aspects of EFs to be distinguishable yet interrelated.

The Development of Executive Functions

Miyake and Friedman's (2012) theory also guided a recent review of the development of EFs from early childhood through emerging adulthood (Best & Miller, 2010). It is fitting to highlight significant developmental progressions in the inhibiting and shifting aspects of EFs, as these are the two aspects of EFs where bilingual individuals tend to show improvement (Bialystok, 2009). In general, this review noted that there are rapid, early improvements in inhibition during the preschool years followed by a slower progression of refinement through emerging adulthood, in which mechanisms develop to handle task complexity and rule use (Best & Miller, 2010). While preschoolers tend to be successful at less complex inhibition tasks, such as Luria's hand game (Hughes, 1998) and the day-night task (Carlson, 2005), adolescents continue to show improvements in accuracy and reaction time for computerized tasks measuring inhibition such as the Stop-signal task and the Flanker task (Huizinga, Dolan, & Van der Molen, 2006). Similarly, emerging adults continued to show improvements in accuracy and response time on Stroop-like inhibition tasks (Huizinga et al., 2006).

Later refinements of inhibition in middle childhood are less drastic than those of preschoolers, however, they are most apparent in brain maturation. For example, Bell, Wolfe, and Adkins (2007) examined changes in brain activity during inhibition tasks from infancy through middle childhood using EEG methodology and revealed that there was a qualitative change in activation. In particular, early activation among infants was more global, activation among preschoolers became more concentrated in the medial frontal region, and lastly children in middle childhood showed more localized activation

in the right frontal scalp regions. These findings suggest that inhibition becomes more specialized over the course of development to be more efficient.

In contrast, the shifting aspect of EFs has a more linear progression of development, in which the inhibiting and shifting aspects of EFs both appear to be prerequisites of shifting between mental tasks (Best & Miller, 2010). Preschoolers become more successful at shifting tasks that involve two simple response sets, with rules embedded in the context of a story. At this age, shifting may not be differentiated from updating or inhibiting as shifting requires much cognitive effort to mentally maintain rule sets and actively stop dominant responses. To examine the variation of shifting skills across development, Luciana and Nelson (1998) used a set-shifting task, with nine different levels that increased in difficulty, called the intradimensional-extradimensional set-shifting task from the Cambridge Neuropsychological Test Automated Battery (CANTAB). From age 5 to 6, a marked improvement in shifting was apparent, in which children were able to apply the same rule set to novel examples. Additionally, the proportion of subjects that were able to complete all nine levels of the task continued to increase through young adulthood, reflecting that shifting skills continue to improve into emerging adulthood.

Davidson and colleagues (2006) also found improvement in participants' shift cost, or the difference in response time between shifting and non-shifting trials, until adulthood. In particular, the participants' shift cost to accuracy decreased until early adolescence, and their shift cost to reaction time increased into adulthood. In other words, emerging adults realize that they must slow down in order to improve their

accuracy on the task. In regards to neural activity, the development of shifting skills appears to be related to an increased activity in the inferior frontal, parietal and anterior cingulate regions and decreased activity in the dorsolateral prefrontal cortex (DLPFC; Rubia et al., 2006). The former increased activity is thought to be indicative of maturing shifting skills, whereas the latter decreased activity suggests that younger children are recruiting additional areas of the brain to compensate for a lack of efficient processing. Altogether, these findings suggest that shifting may continue to develop into emerging adulthood.

Similar to shifting, updating is thought to have a more gradual, linear trajectory of development, depending on how engaged the central executive must be to meet the demands of a task (Best & Miller, 2010). Simpler tasks that require the maintenance of a stimulus tend to reach maturity by age 9 (Luciana et al., 2005), whereas as individuals' performance on more complex updating tasks, involving the maintenance and manipulation of multiple items, continues to develop into adulthood (Luciana & Nelson, 1998). However, unlike shifting and inhibiting, research remains inconclusive as to whether bilingual individuals exhibit strengths in updating (Adesope, Lavin, Thompson, & Ungerleider, 2010; Bialystok, 2009).

Strengths in inhibition and shifting. As previously mentioned, bilinguals exhibit advantages in executive functions that are specific to inhibition and shifting (Bialystok, 2009; 2011). This advantage has been uncovered using a variety of measures, which sometimes capture both inhibition and shifting simultaneously, as these two aspects of EFs can be difficult to disentangle. Earlier in development, bilingual

preschoolers have demonstrated an advantage in Zelazo and colleagues' (1996) dimensional change card sort (DCCS) task, such that bilinguals switch more efficiently between the valence of stimuli (i.e., shape or color; Bialystok & Martin, 2004). The DCCS requires participants to shift between valence rules and inhibit responding to a stimulus according to a prior rule that is not currently relevant. A more recent study confirmed that bilingual kindergartens performed better in a series EFs tasks involving conflicting information that required inhibition (e.g., Attention Network Task [ANT]) and shifting (e.g., DCCS; Carlson & Meltzoff, 2008). The ANT task is very similar to the classic Eriksen Flanker task, inasmuch that participants' respond based on the direction of a middle arrow that is flanked on either side by arrows. This task is generally thought to capture inhibiting skills, but is unique from the Flanker task as it includes a neutral or orienting cue prior to the presentation of arrows, which may prime a particular response. Emerging adults who are bilingual also showed advantages in the ANT task, reflecting greater inhibiting skills, as they have faster reaction times and a smaller conflict effect compared to a normal population (Costa, et al., 2008).

There are two additional computerized tasks measuring EFs where bilinguals have shown advantages. Firstly, the Simon task (Lu & Proctor, 1995) is a non-verbal task that indexes inhibiting skills and consists of congruent and non-congruent trials where the participant must respond to colored stimuli that either match or do not match the side of the colored response keys. Bialystok and colleagues found that bilingual children (Martin-Rhee & Bialystok, 2009), emerging adults (Bialystok, 2006), and older adults (Bialystok, Craik, Klein, & Viswanathan, 2004) perform this task with greater ease,

similar accuracy and faster reaction times for both congruent and non-congruent trials, in comparison to the normal population. Secondly, the Stroop task (Delis, Kaplan, & Kramer, 2001) is a measure of EFs that requires participants to identify the color of the ink a word is printed in for matched color words (i.e., congruent trials) and mismatched color words (i.e., incongruent trials). Bialystok, Craik, and Luk (2008) showed that emerging adults and older adults that are bilingual had a smaller cost in identifying the color of the ink for incongruent trials.

In short, this bilingual advantage has been detected in numerous studies. A recent investigation found that bilinguals' greater performance on inhibition and shifting tasks is present across different cultures or various language pairs, such as Spanish-English speaking bilinguals and Chinese-English speaking bilinguals (Barac & Bialystok, 2012). Still, the existing literature has failed to consider whether language brokers – a special population of bilinguals – may be driving these advantages in EFs found among bilinguals, due to their more frequent and rigorous practice of switching between languages. Thus, the present study aims to test whether language brokers show greater strengths in inhibition and shifting, compared with non-broker bilinguals.

Executive functions and academic achievement. It is important to study factors that predict EFs because they are associated with academic achievement across development (Best, Miller, & Jones, 2009; Bull, Espe, & Wiebe, 2008; St. Clair-Thompson & Gathercole, 2006). For example, Bull, Espe, and Wiebe (2008) revealed that preschoolers' greater EFs provide children with a head start in math and reading that persisted through the end of the second grade. For middle schoolers, updating is robustly

linked to English and math achievement, whereas inhibition is moderately associated with achievement in English, math, and science domains (St. Clair-Thompson & Gathercole, 2006). Although the majority of research relating EFs with academic achievement focuses on the preschool years (Best, Miller, & Jones, 2009), recent findings reveal that the link between EFs and academic achievement is present for children ages 5 through 17 (Best, Miller, & Naglieri, 2011). These correlations were moderate to large for math achievement, and moderate for reading achievement across all ages. To the best of our knowledge, there is no current study linking EFs to academic achievement in late adolescence or in emerging adulthood. However, existing literature (Best, Miller & Jones, 2009; Best, Miller, & Naglieri, 2011) suggests that such an association should continue to persist through emerging adulthood, as fine grain improvements of EFs continue to take place among emerging adults (Best & Miller, 2010).

Language Proficiency

As mentioned above, the linkage between EFs and academic competence may depend on students' language proficiency, which is a key cognitive element that has been found to impact academic success (Ardasheva, Tretter, & Kinny, 2012; Barrett, Barlie, Malm, & Weaver, 2012; Bumgarner, Martin, & Brooks-Gunn, 2013; Cummins, 1979; 2000). Existing literature has established that language minority (LM) learners generally function with smaller vocabulary sizes in either language, compared with monolinguals (Bialystok, 2009; Oller & Eilers, 2002; Perani et al., 2003; Portocarrero, Burright, & Donovan, 2007). More specifically, a significant 10-point gap in vocabulary is evident among bilingual and monolingual children between the ages of 5 and 9, as indexed by the

Peabody Picture Vocabulary Test (PPVT; Bialystok & Feng, 2011). In other words, it seems that the cost of speaking two languages is manifest in bilinguals' smaller vocabulary in a single language.

However, Cummins' lower level threshold hypothesis (1979; 2000) states that once English Language Learners (ELLs), or children who speak English as a second language, reach a particular threshold in language proficiency they will no longer experience low school performance. Ardasheva, Tretter, and Kinny (2012) demonstrated that this threshold hypothesis was applicable to former ELLs in middle school who outperformed current ELLs and English only (EO) students in both reading and mathematics. This finding suggests that once bilinguals are proficient in the language of instruction, for example English for American students, former ELLs may experience academic success. Barrett et al. (2012) found similar results later in development where Latinos' language proficiency during their sophomore year of high school positively predicted their math achievement scores as seniors in high school. Moreover, a recent study warned that public policy reports that exclude Reclassified Fluent English Proficient (RFEPs) students underestimate the progress of students initially identified as ELLs (Saunders & Marcelletti, 2013). In particular, 8th- and 10th-grade academic achievement records from California show that a greater percentage of RFEPs performed at a basic level or better on standardized tests (91% and 87%) compared to EO students in the same grades (85% and 79%) and current ELLs (47% and 35%). Taken together, these studies demonstrate that RFEPs experience comparable or better academic achievement than that of EOs, while current ELLs with lesser language skills lag further

behind. It remains unclear whether a vocabulary gap persists for bilinguals into adulthood. Even though vocabulary skills of late adolescents are regularly assessed using standardized assessments such as the ACT, there is a lack of longitudinal studies rigorously examining vocabulary gaps across later adolescence and adulthood.

A focus on language proficiency across different types of bilinguals is important because language skills tend to be highly predictive of academic performance in college for students in general. Interestingly, one older study investigated the language proficiency skills of Latino emerging adults' who were bilingual in relation to their college GPA (Mestre, 1981). This study revealed that all the indices within the Test of Reading (TOR), indexing Latinos' English language proficiency and skills, were significantly associated with their current college GPA (Mestre, 1981). To the best of our knowledge, no other studies have examined the relation between bilingual emerging adults' language proficiency and their academic performance. However, this study suggests that the relation between language proficiency and academic success extends beyond high school. Moreover, language proficiency may be predictive of standardized test scores as well. Correlations between language proficiency and SAT scores have been found, where students' verbal scores on their Scholastic Aptitude Test (SAT) test in high school was most predictive of their cumulative GPA in college (Ruban & McCoach, 2005), more so than SAT scores in math, high school rank, or the academic level of their college major. This was true for both males and females, with females having greater verbal SAT scores and subsequently higher college GPAs on average (Ruban & McCoach, 2005).

Moderating role of language proficiency. The direct link between students' executive functions and academic achievement may depend on bilinguals' language proficiency, such that the benefits of better EFs may not be apparent until ELLs attain a certain threshold in language proficiency (Cummins, 2000). A recent study examined students' language proficiency as a moderator of the association between later math achievement and children's approaches to learning (ATL), a related measure of EFs reported by classroom teachers (e.g., persists in completing tasks; Bumgarner, Martin, & Brooks-Gunn, 2013). Language proficiency is speculated to act as a moderator, because the working memory of students less proficient in English may be too burdened with a large cognitive load, for better EFs to bring about academic success (Paas, Touvinen, Tabbers, & Van Gerven, 2003). This past study revealed that ELLs' ATL predicted math achievement in third grade so long as a student was proficient in English.

While no current study has examined language proficiency as a moderator between emerging adults' executive functions and academic achievement, a few studies have considered such factors as meaningful to college students' aptitude or achievement in general. For example, Alderman (1982) explored whether English language proficiency strengthened the association between Puerto Rican high school students SAT scores and a comparable Spanish aptitude test called the Prueba de Aptitud Academica (PAA). This study showed that indeed students' English language proficiency was a moderator of this link, with better English skills improving the link between the two aptitude tests. In other words, the SAT was a truer depiction of students' scholastic aptitude, as indexed by the PAA, so long as the student was more proficient in English.

In addition, another study found that emerging adults' English language skills and approaches to learning (ATL) were predictive of their college GPA (Zeegers, 2004). This prior study suggests English language skills and a related measure of EFs are relevant to students' academic success at the university level, though no interaction between EFs and language proficiency was tested. The current investigation builds on these findings by using a direct, observable measure of EFs that is less vulnerable to subjective biases of reported measures, such as teacher-reported ATL. In this way, this dissertation investigates the moderating role of English language proficiency on the link between emerging adults' executive functions and academic achievement (see Figure 6).

Research Questions and Hypotheses

To review, the present study is the first to examine whether Latino emerging adults' language brokering is related to cognitive, linguistic, and academic skills in a series of models that are grounded in current literature and seek to expand it. The following research questions and hypotheses guided this dissertation.

- (1) Was there a direct association between language brokering and academic achievement in emerging adulthood (See Figure 1)? The proposed study hypothesized that students who language broker will demonstrate higher levels of academic skill.



Figure 1. Language brokering predicting emerging adults' academic success

- (2) Was there a direct association between language brokering and young adults' executive functions (see Figure 2)? It was expected that language brokering would be positively associated with executive functions.



Figure 2. Language brokering predicting emerging adults' executive functions

- (3) Were emerging adults' executive functions related to their academic success (see Figure 3)? It was hypothesized that EFs would be positively related to academic performance regardless of bilinguals' brokering status.



Figure 3. Executive functions predicting emerging adults' academic achievement

- (4) Did emerging adults' EFs explain the association between brokering and academic

achievement (see Figure 4)? It was hypothesized that young adults' language brokering would be positively related to their EFs, which in turn would be positively associated with their academic achievement.

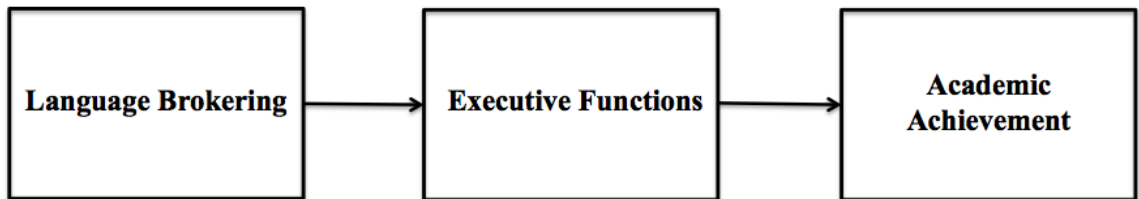


Figure 4. Emerging adults' executive functions mediating the link between language brokering and academic achievement

(5) Did the link between executive functions and academic success depend on emerging adults' English language proficiency (see Figure 5)? It was hypothesized that emerging adults' English language proficiency would strengthen the relation between executive functions and academic achievement.

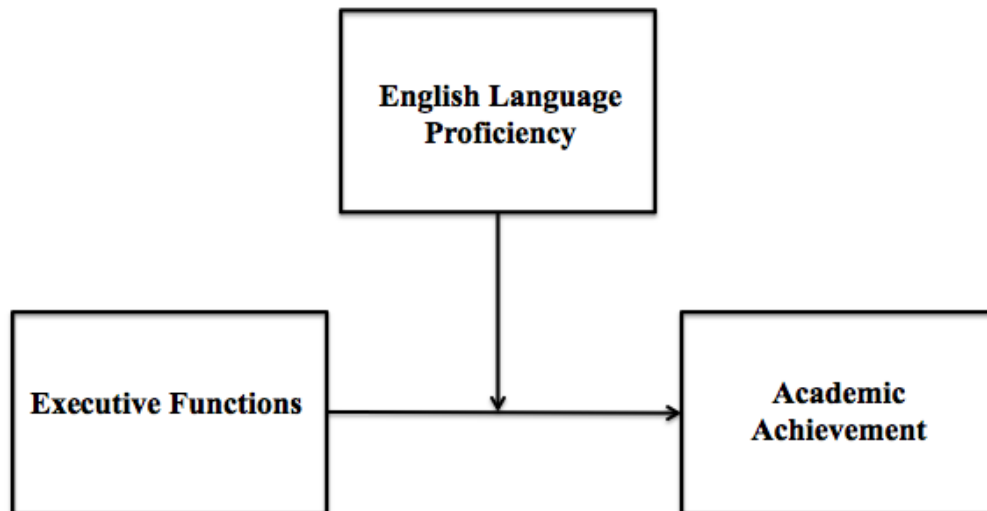


Figure 5. English language proficiency moderating the link between emerging adults' executive functions and academic achievement

(6) Did emerging adults' greater English language proficiency skills improve the mediating pathway between language brokering practices and academic success (see Figure 6)? The present study hypothesized that the potential positive association between emerging adults' brokering practices and academic achievement would vary as a function of language proficiency. In other words, EFs were expected to play a larger mediating role between brokering and academic competence when students had higher levels of language proficiency.

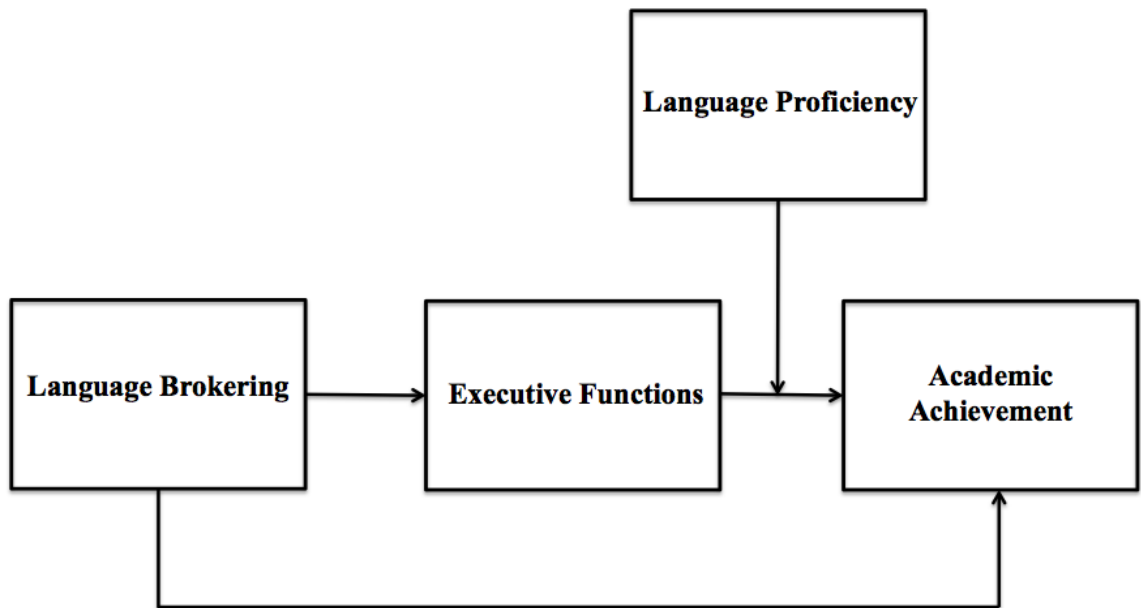


Figure 6. Proposed full model of emerging adults' language brokering and academic achievement

Exploring language brokering across developmental periods. In addition to the main hypotheses outlined above, this dissertation explored language brokering

experiences across multiple developmental stages. Qualitative research suggests that there may be various patterns of language brokering across different periods of development (Dorner, Orellana, & Li-Grining, 2007; Orellana, 2003; 2009; Orellana et al., 2003), where some individuals may start and stop brokering at varying ages.

Specifically, language brokering may occur in middle childhood (i.e., ages 4-8), early adolescence (i.e., ages 9-13), and/or late adolescence (i.e., ages 14-18). These distinct periods of development deserve attention given that they reflect key periods in literacy development, such that one learns to read from preschool to 3rd grade (e.g., 4-8 years), reads to learn from 4th grade to 7th grade (e.g., 9-13 years), begins integrating multiple viewpoints in reading materials from 8th grade through senior year of high school (e.g., 14-18 years), and uses reading to construct and reconstruct one's world view beyond age 18 (Chall, 1983).

There may be individuals who were language brokers across all three of these periods – from *middle childhood* to *late adolescence*. This type of language broker is more likely to be an oldest child who has served as the families' most direct link to the host culture and language across their childhood and beyond (Dorner, Orellana, & Jimenez, 2008). Furthermore, this type of broker is more experienced and seasoned in their language brokering.

In addition, there may be individuals who language broker during *late adolescence*. This type of broker may be able to supply family members with a higher quality of translation, stemming from their more developed EFs (Best & Miller, 2010), having greater language proficiency (Saunders & Marcelletti, 2013), and their capacity to

integrate multiple perspectives while brokering (Chall, 1983). Such brokering may occur later in adolescence when an older sibling moves out of the house and there is a need for someone to take on the sibling's former responsibilities (Dorner, Orellana, & Jimenez, 2008).

Lastly, there could be individuals who broker earlier in life, but not later. For example, individuals could broker during *middle childhood and/or early adolescence only*, but not during late adolescence. For these individuals, language brokering may have attenuated later in development once parents acquired English language skills and were no longer were reliant on their children to language broker (Dorner, Orellana, & Jimenez, 2008; Orellana, 2009). Subsequently, language brokering became more infrequent or may have ceased entirely.

To our knowledge, existing research has not examined patterns of language brokering across multiple periods of development. Taking a first step in exploring these patterns, this dissertation posed an additional set of hypotheses regarding the potential advantages of showing different patterns of language brokering (i.e., brokering from middle childhood to late adolescence, brokering during late adolescence, brokering during middle childhood and/or early adolescence only).

For instance, in addition to Hypotheses 1 and 2, it was also expected that individuals who brokered from middle childhood to late adolescence would demonstrate greater academic achievement and better executive functions than those individuals who did not broker consistently across these developmental stages. Similarly, in addition to Hypotheses 4 and 6, it was expected that EFs would play a stronger mediating role and

that language proficiency would play a larger moderating role among individuals who were consistent brokers across multiple developmental periods vs. those individuals who were inconsistent brokers. Such associations have been found in other areas of the developmental psychology literature. For instance, children who consistently live in poverty across developmental periods are more at risk for less optimal development than children who experience poverty less often (Duncan, Brooks-Gunn, & Klebanov, 1994; Duncan & Magnuson, 2005). It could be that consistent experience with language brokering similarly confers more cognitive and academic advantages upon individuals than inconsistent experience with language brokering.

Furthermore, it was expected that individuals who started brokering in late adolescence would have higher academic skills and better executive functioning than individuals who started brokering earlier (during middle childhood and/or early adolescence), but did not continue to do so into late adolescence. It is possible that language brokering may be less beneficial when it starts early but does not last because at earlier stages, EFs and English language skills are still developing (Best & Miller, 2010; Cummins, 2000; Chall, 1983).

CHAPTER THREE

METHOD

Participants

The present study includes a survey sample of 430 bilingual participants. Although the focus of the present study is on Latino students ($n = 167$), data were also collected from non-Latino students ($n = 263$) as an exploratory step toward understanding the role of language brokering in the cognitive and academic skills of a diverse set of bilinguals from non-Latino backgrounds. Participants were recruited from a Midwestern, urban university, and participants were screened using the standard online recruitment system for the university's Department of Psychology. Following the online survey, a subset of Latino, Spanish-English speaking participants ($n = 83$) were invited to complete direct assessments in a laboratory setting. These participants were selected using Dorner, Orellana, and Li-Grining's (2007) criteria for language brokers (see below for more details on the language brokering measure).

To ensure that the present study could adequately address each research question, an a priori power analysis was performed with G*Power version 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). A sample size of 79 participants was suggested to detect a small effect size ($f^2 = 0.08$; Cohen, 1988). While the survey sample easily exceeded 79 participants ($N = 430$), the subset of participants who came into the laboratory for direct measures of EFs and language proficiency also met the a priori sample size

recommended by the power analysis ($n = 83$). All missing data were addressed by performing multivariate imputation with chained equations in SPSS, which considers the patterns of existing data among variables of interest and demographic variables (Azur, Stuart, Frangakis, & Leaf, 2011; Sinharay, Stern, & Russell, 2001).

Procedure

Data was primarily collected from the fall of 2013 until the fall of 2014 ($n = 425$), with an average of 142 students completing the online survey per semester. Only 5 participants were recruited prior to that period. As part of the informed consent process, participants voluntarily elected to release their academic records (e.g., current GPA and ACT scores). If students agreed to share their academic records, they were then asked to complete the online survey portion of the study which indexed a variety of constructs including self-reports of language brokering, executive functions, English/other language fluency, and background characteristics of participants and their families. This online survey took approximately 45 to 60 minutes to complete, and participants received one class credit for participating in the online survey. Participants were then screened, based on their language brokering practices, and a subset of Latino, Spanish-English bilinguals were invited for further testing in the laboratory. When participants arrived in the laboratory, they completed a battery of computerized cognitive measures in English and Spanish. Participants used a mouse to respond to various test items. This cognitive battery took approximately 30 minutes to complete, which included 8 minutes of language proficiency assessments in English and Spanish. Participants were compensated with \$15 per hour.

Measures

For several constructs, the proposed study employed multi-method indices, including both self-report and direct behavioral measures of main constructs of interest. To better understand the measures and their alignment with the study's research questions, refer to Appendix B.

Language brokering. This dissertation captured language brokering (i.e., the linguistic experience of translating for family or friends) by adapting the measure used by Dorner and colleagues (2007, see Appendix C for details). In general, this survey asked participants to report on the number of items they translate, the frequency with which they translate for particular family members, and the number of contexts that they broker in. As such, active language brokers were defined as bilinguals who translated eight or more materials or conversations, with at least one difficult material (e.g., medical bills) for a mother, father, or extended family member on a daily basis in four or more contexts (see Table 1). In contrast, non-broker bilinguals translated three or fewer items for a family member infrequently in one location at most (see Table 1).

Table 1. Criteria for Language Brokers and Non-Brokers based on Frequency of Translating Items for Various People, in Different Contexts

	No. of Items Translated	Recipients of Translation	No. of Different Contexts
Language Broker	Eight or more items, with at least one difficult item (e.g., legal document)	Mother, father, or grandparent daily; or for at least two of them sometimes	Four or more
Non-broker Bilingual	Three or fewer items	For other family members, sometimes or never	One or zero

This survey was modified to the extent that participants reported on whether they currently engaged in brokering practices and whether they did so in the past, and specifically during middle childhood (ages 4-8), early adolescence (ages 9-13), and late adolescence (ages 14-18). Similar to the original measure, participants were asked to recall how frequently they brokered, for whom they brokered (e.g., parents, extended family), and the kinds of items they brokered (e.g., phone calls, medical bills) across these different periods of development. Retrospective data is not equivalent to longitudinal data as reporters' memory of prior brokering is more vulnerable to error (Miller, Cardinal, & Glick, 1997). However, to assist participants in recalling prior brokering experiences, they were reminded of the approximate grades in school they were attending during that period, for example from preschool to third grade for middle childhood.

Based on the data above, participants were coded in two ways, where two sets of analyses were conducted to test the main set of hypotheses. In one set of analyses, language brokering reflected whether participants were *current brokers or not*. In a second set of analyses, language brokering reflected whether participants were *ever brokers or not*, meaning that they brokered currently or in at least one of the earlier stages above (i.e., middle childhood, early adolescence, late adolescence).

Exploratory analyses examined patterns of brokering across the three earlier developmental periods above, and language brokers were coded into three categories: *stable brokers* engaged in language brokering in middle childhood, early adolescence, and late adolescence; *recent brokers* participated in language brokering in late

adolescence; and *early brokers* translated for others in middle childhood and/or early adolescence, but not in late adolescence. See Appendix A for more details.

Executive functions. Two types of executive function assessments were used, which included a self-report and a direct measure. Included in the online survey was the Behavior Rating Inventory of Executive Functions: Adult Version (BRIEF-A; Guy, Isquith, & Gioia, 2004). This measure taps purposeful, problem-solving, and goal-directed behavior. The particular subscales that were included index participants' updating, inhibiting, and shifting skills (see Appendix D) and the alphas of these subscales ranged from .81 to .88. Eight items measuring *updating* captured participants' perception of their ability to actively retrieve and hold information in one's mind with the intention of manipulating or processing it (e.g., "I forget instructions easily"). Eight items measured participants' perceived *inhibition* or one's ability to control impulsive behavior and appropriately modulate behavior (e.g., "I have trouble sitting still). Finally, 6 items indexed participants' *shifting* skills, which was conceptualized as either a behavioral or cognitive shift in which one adjusts their behavior or problem solving in a flexible manner (e.g., "I have trouble changing from one activity or task to another"). These particular subscales of the BRIEF-A were reliable and each subscale demonstrated appropriate internal consistency ($\alpha = 0.73$ to .98) (Gioia, Isquith, & Kenealy, 2008). Past studies have also established convergent validity with similar measures of executive functions (Bracken & Keith, 2004; Broadbent, Cooper, Fitzgerald & Parkes, 1982).

The direct assessment of EF was part of a battery created by the National Institute of Health (NIH) Toolbox (Gershon, et al., 2010; Zelazo et al., 2013). Three tasks from

the NIH Toolbox were employed to capture each of the following dimensions of EFs: inhibiting, shifting, and updating. The Flanker Inhibitory Control Test and Attention Test indexed participants' *inhibition* (see Appendix E). The Flanker task required participants to focus on a center stimulus while inhibiting attention to surrounding stimuli flanking it (e.g., arrows for ages 8-85). Sometimes the middle stimulus was pointing in the same direction as the "flankers" (i.e., congruent trial) and sometimes in the opposite direction (i.e., incongruent trial). Scoring was based on a combination of accuracy and reaction time, and the test took approximately 3 minutes to administer. These trials were designed to be simple to most purely measure inhibition.

The Dimensional Change Card Sort Test captured participants' *shifting* or cognitive flexibility (see Appendix F). During this test, two target pictures were presented that vary along two dimensions (e.g., shape and color). Participants were asked to match a series of bivalent test pictures (e.g., yellow balls and blue trucks) to the target pictures, first according to one dimension, color. Then, after a number of trials participants matched stimuli according to a second dimension, shape. "Switch" trials occurred when participants needed to change the dimension being matched. For example, after 4 straight trials matching on shape, the participant may be asked to match on color for the following trial and then return to shape, thus requiring the cognitive flexibility to select the appropriate target. Scoring was based on a combination of accuracy and reaction time, and the test took approximately 4 minutes to administer.

Lastly, to capture *updating*, this dissertation used the List Sorting Working Memory Test, which required participants to recall and sequence different stimuli

presented visually and orally (see Appendix G). During this task, pictures of different foods and animals were displayed on the computer screen with an accompanying audio recording, and participants were asked to say the items back in size order from smallest to largest. First, participants did this within a single dimension (either animals or foods) and second on 2 dimensions (first foods, then animals). Participants' raw score was equal to the number of items recalled and sequenced correctly, and the test took approximately 7 minutes to administer. All of the participants' scores on these tests are available as unadjusted or age-adjusted scores (Gershon, et al., 2010). Age adjusted scores were used in this dissertation.

Academic achievement. Academic records included participants' American College Test (ACT) scores and their current overall grade point average (GPA) from their official university transcripts. In terms of the ACT, the overall composite score was used which reflects students' performance on English, math, reading, and science sections of the ACT (i.e., *minimum* = 1; *maximum* = 36). Composite scores in the present sample ranged from 17 to 35, with an average score of 25.56 (SD = 3.31).

The GPA refers to letter grades assigned by instructors of courses taken by students, where letters correspond to different points. The mean of these points across classes taken by each student is his or her GPA. At this university, the following letters are worth the following points: A = 4.0, A- = 3.7, B+ = 3.3, B = 3.0, B- = 2.7, C+ = 2.3, C = 2.0, C- = 1.7, D+ = 1.3, D = 1.0, F = 0. The current GPA in the present sample ranged from 0.92 to 4.00, with an average GPA of 3.02 (SD = .58). Past research has used self-reported GPA, which has been correlated with actual grades at .76 (Acoach &

Webb, 2004; Buriel et al., 1998). Nevertheless, rather than using a proxy, this dissertation will use a direct measure of GPA.

It is noteworthy that the present sample consists of B average students, which may imply a higher GPA on average is awarded at this particular university. In comparison, the average ACT score of students at the same university reflects a 71% or C-average score on the ACT exam, reflecting the more normal, bell-shaped distribution (Herrnstein & Murray, 2010). Moreover, it is important to note the differences evident in the distribution of these two academic measures.

Language fluency. Four indicators of language fluency were used, including two measures of English proficiency and two assessments of other language proficiency. These measures captured how well participants were able to speak and/or comprehend English and their other language, for example Spanish.

The self-report measure of language proficiency was based on the Language Experience and Proficiency Questionnaire (LEAP-Q; Marian, Blumenfeld, & Kaushanskaya, 2007). This measure has established criterion-based validity, such that global measures of proficiency have been generally associated with one's overall language ability (Marian et al., 2007). Specifically, participants' reported reading proficiency has been more predictive of first-language performance, and their reported speaking proficiency has been more predictive of second-language performance.

The LEAP-Q is comprised of 6 items that capture bilinguals' language proficiency. Participants were asked to rate how well they understand, speak, and read in English and their other language, using a scale from 0 to 10 (i.e., *0 = not at all and 10 =*

superior). The Cronbach's alpha for language proficiency in English was .95, and for participants' other language the alpha was .68. The lower internal reliability for the other language LEAP-Q may reflect lower rates of biliteracy in bilingual's non-English language. To index participants' English language proficiency, scores for understanding, speaking, and reading were averaged to create a composite variable for that language. An analogous score was created in the same manner for participants' other language proficiency.

For the direct assessment of language proficiency, the Picture Vocabulary Test (DeMars, 2010) from the NIH Toolbox was used in English and Spanish. This task has been deemed appropriate for participants who are between ages 3- to 85-years-old. During the task, participants are presented with an audio recording of a word and four photographic images on the computer screen, and they were asked to select the picture that most closely matched the meaning of the word (see Appendix J). This task was not time sensitive, and participants were able request to hear the vocabulary word again by pressing the "play again" button. Scores are based on item response theory (DeMars, 2010), where the first vocabulary item given is based on the last school grade completed by the participant, and subsequent items are generated based on the accuracy of participants' prior responses. Computer generated scores for English and Spanish language proficiency were used in analyses.

Background characteristics. Participants were asked to report on several background items measuring various characteristics about themselves and their families, which may be associated with their level of language fluency, likelihood of being a

language broker, and academic achievement. Specifically, participants were asked to report on their gender, age, native language, generation status, birth order, number of siblings, parents' educational attainment, and household income.

CHAPTER FOUR

RESULTS

Descriptive Statistics

Before testing the hypotheses outlined above, descriptive statistics were estimated. All participants spoke at least two languages fluently, with 38.8% of the sample speaking Spanish and English fluently ($n = 167$), and 61.2% of the remaining bilingual participants ($n = 263$) speaking 37 different bilingual combinations with English (see Table 2). Participants were between the ages of 17 and 30 ($M = 19$, $SD = 1.6$). The race/ethnicity of this sample was 31.4% Caucasian ($n = 135$), 34.7% Asian ($n = 149$), 27.7% Hispanic/Latino ($n = 119$), 1.4% African American/African ($n = 6$), and 4.9% other ($n = 21$).

Subsequent analyses were then conducted separately for three groups of participants: 1) Latinos, 2) a subset of Latinos who took part in laboratory assessments, and 3) non-Latinos. Among the Latino bilinguals in the survey sample there was a higher percentage of language brokers, with approximately 33.5% are language brokers, and 66.5% are non-broker bilinguals. Within the subset of Latino bilinguals who participated in laboratory assessments, there were 48.2% ($n = 40$) language brokers and 51.8% ($n = 43$) non-broker bilinguals. Within the non-Latino sample, 21.3% ($n = 56$) were classified as language brokers at some point across development, and 78.7% ($n = 207$) were classified as non-broker bilinguals who never brokered.

Table 2. Descriptive Table of Bilingual Survey Participants' Other Language in Conjunction with English (N = 430)

Language	<i>n</i>	%	Cumulative %
Albanian	3	0.7%	0.7%
Arabic	14	3.3%	4.0%
Assyrian	4	0.9%	4.9%
Bengali	2	0.5%	5.3%
Bosnian	2	0.5%	5.8%
Bulgarian	1	0.2%	6.0%
Chinese	13	3.0%	9.1%
Creole	1	0.2%	9.3%
Croatian	2	0.5%	9.8%
Dinka	1	0.2%	10.0%
Farsi/Persian	3	0.7%	10.7%
French	9	2.1%	12.8%
German	6	1.4%	14.2%
Greek	8	1.9%	16.0%
Hmong	1	0.2%	16.3%
Indian Dialect	70	16.3%	32.6%
Italian	4	0.9%	33.5%
Japanese	3	0.7%	34.2%
Korean	4	0.9%	35.1%
Lao	1	0.2%	35.3%
Lithuanian	3	0.7%	36.0%
Malayalam	3	0.7%	36.7%
Marathi	1	0.2%	37.0%
Montenegrin	1	0.2%	37.2%
Polish	50	11.6%	48.8%
Portuguese	2	0.5%	49.3%
Romanian	7	1.6%	50.9%
Russian	7	1.6%	52.6%
Serbian	2	0.5%	53.0%
Spanish	168	39.1%	92.1%
Tagalog	13	3.0%	95.1%
Telugu	2	0.5%	95.6%
Thai	2	0.5%	96.0%
Turkish	1	0.2%	96.3%
Ukrainian	6	1.4%	97.7%
Uzbeki	1	0.2%	97.9%
Vietnamese	7	1.6%	99.5%
Yoruba	2	0.5%	100.0%

In general, language brokers tended to be female, were less likely to be native English speakers, had lower generation status, and came from households with lower educational attainment. Non-brokers came from higher income households. Table 3 presents descriptive statistics for Latinos and non-Latinos separately, and within each group, bivariate analyses tested for differences across language brokers and non-language brokers. Among Latino bilinguals, roughly three quarters of language brokers and non-brokers were female (see Table 3). In regards to speaking English as one's native language, just under 40% of Latino brokers were native English speakers. Latino brokers had significantly lower generation status in contrast to non-brokers (see Table 3). Regarding family structure, Latino brokers and non-brokers were similar in that approximately 40% of Latinos were first-born individuals. However, Latino brokers had significantly more siblings, having an average of 2 siblings in comparison to Latino non-brokers who had an average of 1-2 siblings. Latino brokers also came from homes with parents who had lower educational attainment. In particular, only 18.5% of Latino brokers' fathers and 26.8% of mothers' completed more than a high school education. Background characteristics for the Latinos with direct assessment data (i.e., NIH subset) were roughly similar to that of the Latino subsample (as displayed in Tables 3 and 4).

Table 3. Background Characteristics of the Full Survey Sample (N = 430), Examining Differences Across Latino Heritage and Broker Status

	Latino Bilinguals		Non-Latino Bilinguals	
	Brokers	Non-Brokers	Brokers	Non-Brokers
	<i>n</i> = 56 <i>M</i> (<i>SD</i>) or %	<i>n</i> = 111 <i>M</i> (<i>SD</i>) or %	<i>n</i> = 56 <i>M</i> (<i>SD</i>) or %	<i>n</i> = 207 <i>M</i> (<i>SD</i>) or %
Background Characteristics				
Female	71.4%	77.4%	91.1%	** 70.0%
Age	19.5 (2.4)	19.4 (1.6)	19.0 (1.3)	19.2 (1.7)
Native English	38.2%	*** 73.7%	37.5%	** 58.0%
Generation Status	1.92 (.33)	*** 2.25 (.61)	1.77 (.29)	* 1.93 (.49)
First Born	40%	37.30%	35.70%	43.20%
Number of Siblings	2.07 (1.13)	* 1.67 (.97)	1.61 (1.14)	1.56 (1.11)
Socio-Economic Status				
Mother Education	26.8%	*** 59.8%	37.5%	*** 68.9%
Father Education	18.5%	*** 63.3%	48.2%	** 72.2%

Note. T-tests and chi-square analyses were conducted to compare groups. Parental Education is measured as more than high school. ^a $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

In contrast, among the non-Latino participants, language brokers were significantly more likely to be female than non-language brokers (see Table 3). This may reflect the demographics of the university, yet literature corroborates that a large number of brokers are female (Buriel et al., 1998; Morales & Hanson, 2005; Weisskirch, 2005). Non-Latinos brokers were also less likely to be a native English speaker and have significantly lower generation status compared to non-Latinos who did not broker (see Table 3). In terms of family structure, however, non-Latino brokers and non-brokers were more similar, with approximately 40% of non-Latinos being first-born individuals and having an average of 1-2 siblings. In regards to SES, non-Latino brokers' parents had significantly lower educational attainment. For example, only 48.2% of language brokers' fathers and 37.5% of their mothers pursued education beyond high school.

Table 4. Background Characteristics of the NIH Subset of Latino Bilinguals (n = 83), Examining Differences Depending on Broker Status

	Latino Bilinguals	
	Brokers	Non-Brokers
	<i>n</i> = 40 <i>M (SD)</i> or %	<i>n</i> = 43 <i>M (SD)</i> or %
Background Characteristics		
Female	72.5%	76.4%
Age	19.6 (2.4)	19.7 (2.1)
Native English	40.0% **	69.8%
Generation Status	1.93 (.37) ***	2.38 (.64)
First Born	43.5%	37.5%
Number of Siblings	2.08 (1.12)	1.78 (1.0)
Socio-Economic Status		
Mother Education	27.5% **	63.4%
Father Education	20.5% **	62.5%

Note. T-tests and chi-square analyses were conducted to compare groups.

Parental education is measured as more than high school. $t p < .10$,

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

Notably, there was wide heterogeneity in participants' income. The household income of Latino brokers and non-brokers is discussed (see Figure 7). Latinos who do not broker appear to have a bimodal distribution, in which they tend to come from households earning \$50,000-\$70,000 or \$130,000 and above. In comparison, Latino brokers had a more normal distribution, with households averaging between \$30,000-\$70,000 per year. It is evident in this figure that there are two distinct income groups present among Latino non-brokers, in comparison to the one income group apparent among Latino brokers.

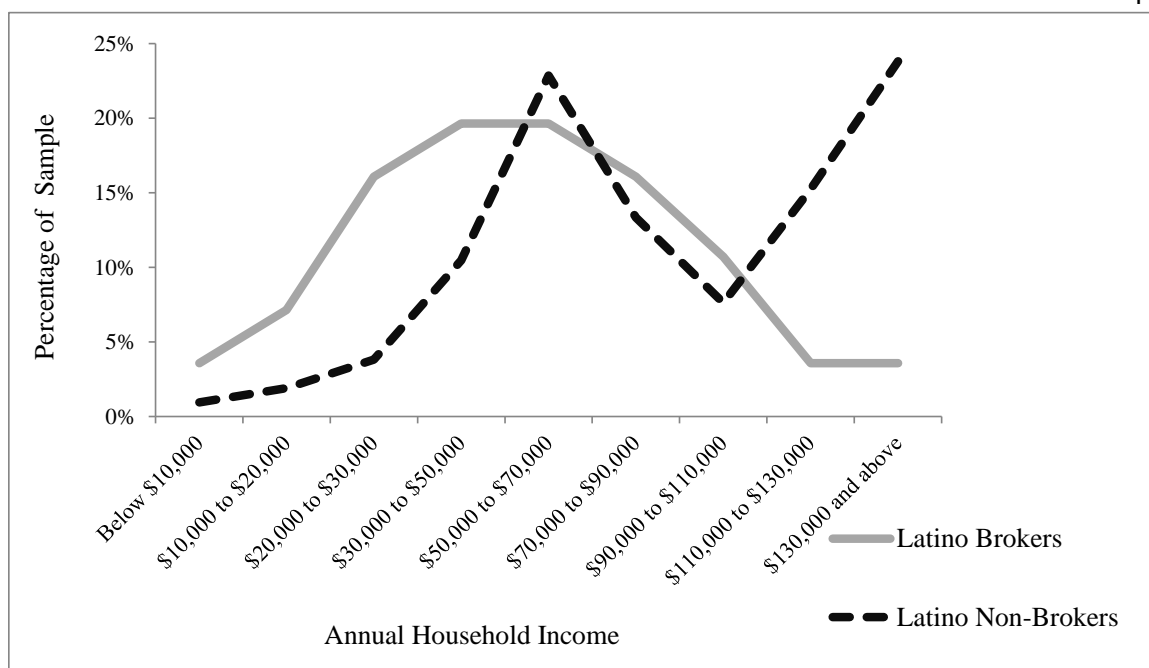


Figure 7. Comparing the distribution of annual household income for Latino brokers and non-brokers ($n = 167$)

Among non-Latinos, a comparison of annual household income is displayed by broker status in figure 8. The distribution for non-Latinos who do not broker generally rises, with \$130,000 and above serving as the mode. In contrast, non-Latinos' distribution of annual household income is more positively skewed, with a lower mode of \$30,000-\$50,000. In general, figure 8 suggests that non-Latino brokers come from lower income households.

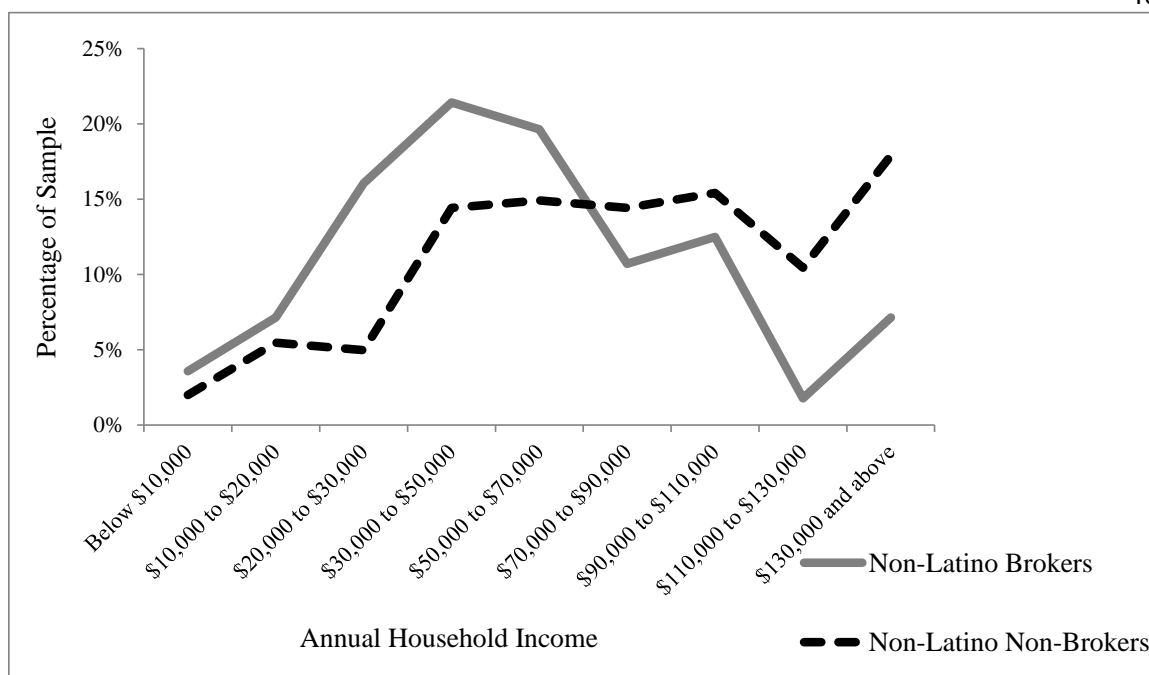


Figure 8. Comparing the distribution of annual household income for non-Latino brokers and non-brokers ($n = 263$)

Bivariate associations among the main variables of interest. Before addressing the research questions, it is a necessary step to explore how the main variables of interest covary. Mean values for executive functions, language proficiency, and academic skills are tabled for the Latino, NIH Latino, and non-Latino subsamples and are presented for brokers and non-brokers within each group (see Tables 5, 6, 7, & 8). Tables 6 and 8 reflect means and standard deviations for non-imputed data. Observed mean values for language proficiency in both English and Spanish are only available for the NIH subsample of Latino participants (see Table 7 & 8).

In addition, correlations among the executive functions, language proficiency, and academic scores were estimated. As shown in Table 9, the self-report measures of EFs were correlated with one another at a moderate to strong level. However, among the direct measures of EFs, only inhibiting and shifting skills were correlated with one

another, and the association was moderate in size. Furthermore, self-report measures of EFs were modestly linked with participants' direct measure of shifting, and there was a small association between the direct measure for updating the self-report of shifting.

The bottom half of Table 9 lists correlation coefficients for language proficiency and academic achievement. The self-report and direct measure of English language proficiency were modestly linked. Students' college GPAs were moderately linked to greater ACT scores. The direct measure of English language proficiency was modestly related to self-report and direct assessments of EFs. In addition, there were moderate associations between ACT scores and all three direct measures of EFs, between ACT scores and the direct index of English language proficiency. For GPA, there was only a moderate relation with the direct assessment of shifting. All significant correlations were in a positive direction.

Table 5. Descriptives of Key Variables for the Full Survey Sample (N = 430), Depending on Latino Heritage and Broker Status

	Latino Bilinguals		Non-Latino Bilinguals	
	Brokers	Non-Brokers	Brokers	Non-Brokers
	<i>n</i> = 56 <i>M</i>	<i>n</i> = 111 <i>M</i>	<i>n</i> = 56 <i>M</i>	<i>n</i> = 207 <i>M</i>
Executive Functions				
Inhibiting (BRIEF-A)	2.29	2.35	2.22	2.34
Shifting (BRIEF-A)	2.38	2.51	2.28	2.41
Updating (BRIEF-A)	2.37	2.48	2.33	2.42
Language Proficiency				
English LEAP-Q	9.52	9.77	9.73	9.69
Other Language LEAP-Q	8.79	8.23	7.78	7.33
Academic Achievement				
ACT Scores	23.52	25.62	25.54	26.18
College GPA	2.91	3.07	3.01	3.00

Note. No standard deviations are given for analyses using imputed data.

Table 6. Descriptives of Key Variables for the Full Survey Sample, Depending on Latino Heritage and Broker Status

	Latino Bilinguals					Non-Latino Bilinguals				
	Brokers			Non-Brokers		Brokers			Non-Brokers	
	<i>M (SD)</i>	<i>n</i>		<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>		<i>M (SD)</i>	<i>n</i>
Executive Functions										
Inhibiting (BRIEF-A)	2.29 (.49)	56		2.35 (.43)	107	2.22 (.43)	56	<i>t</i>	2.34 (.45)	204
Shifting (BRIEF-A)	2.38 (.50)	56	<i>t</i>	2.51 (.44)	107	2.28 (.50)	56	<i>t</i>	2.41 (.51)	204
Updating (BRIEF-A)	2.37 (.55)	56		2.48 (.43)	107	2.33 (.55)	56		2.42 (.51)	204
Language Proficiency										
English LEAP-Q	9.52 (.83)	55	<i>t</i>	9.79 (.94)	108	9.75 (.83)	55		9.68 (.94)	204
Other Language LEAP-Q	8.79 (1.22)	56	*	8.23 (1.66)	107	7.78 (1.75)	54		7.33 (1.93)	204
Academic Achievement										
ACT Scores	23.23 (2.76)	48	***	25.70 (3.57)	101	25.57 (2.90)	54		26.23 (3.02)	190
College GPA	2.89 (.50)	48	*	3.09 (.58)	88	3.02 (.52)	46		3.01 (.61)	168

Note. T-tests were conducted to compare groups. t $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7. Descriptives of Key Variables for the NIH Subset of Latino Bilinguals (n = 83), Depending on Broker Status

	Latino Bilinguals	
	Brokers	Non-Brokers
	<i>n</i> = 40 <i>M</i>	<i>n</i> = 43 <i>M</i>
Executive Functions		
Inhibiting (BRIEF-A)	2.26	2.38
Shifting (BRIEF-A)	2.35	2.53
Updating (BRIEF-A)	2.29	2.51
Inhibiting (NIH- Flanker)	86.85	87.02
Shifting (NIH- DCCS)	94.41	95.90
Updating (NIH- WMT)	99.15	103.71
Language Proficiency		
English LEAP-Q Aggregate	9.46	9.87
Spanish LEAP-Q Aggregate	8.96	8.46
English PVT (NIH)	101.44	106.72
Spanish PVT (NIH)	104.01	102.57
Academic Achievement		
ACT Scores	23.03	25.61
College GPA	2.90	3.16

Note. No standard deviations are given for analyses using imputed data.

Table 8. Descriptives of the NIH Subset of Latino Bilinguals, Examining Differences in Key Variables Depending on Broker Status

	Latino Bilinguals			
	Brokers		Non-Brokers	
	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>
Executive Functions				
Inhibiting (BRIEF-A)	2.26 (.49)	40		2.38 (.42) 39
Shifting (BRIEF-A)	2.35 (.56)	40	<i>t</i>	2.53 (.40) 39
Updating (BRIEF-A)	2.29 (.60)	40	<i>t</i>	2.52 (.45) 39
Inhibiting (NIH- Flanker)	86.85 (4.78)	39		87.02 (5.21) 41
Shifting (NIH- DCCS)	94.41 (6.60)	40		95.90 (7.53) 41
Updating (NIH- WMT)	99.15 (12.20)	40	<i>t</i>	103.71 (11.51) 41
Language Proficiency				
English LEAP-Q Aggregate	9.46 (.89)	39	**	9.88 (.38) 39
Spanish LEAP-Q Aggregate	8.96 (1.05)	40	<i>t</i>	8.46 (1.26) 39
English PVT (NIH)	101.44 (12.29)	40	<i>t</i>	106.72 (14.81) 41
Spanish PVT (NIH)	104.01 (12.53)	40		102.57 (14.27) 41
Academic Achievement				
ACT Scores	22.58 (2.46)	33	***	25.50 (3.87) 36
College GPA	2.89 (.50)	32	*	3.16 (.53) 35

Note. T-tests were conducted to compare groups. *t p* < .10, * *p* < .05, ** *p* < .01, *** *p* < .001

Table 9. Bivariate Correlations for Variables of Interest

	1	2	3	4	5	6	7	8	9	10	11	12
1. Inhibiting (BRIEF-A)	-											
2. Shifting (BRIEF-A)	0.53**	-										
3. Updating (BRIEF-A)	0.63**	0.62**	-									
4. Inhibiting (NIH- Flanker)	0.02	0.04	0.00	-								
5. Shifting (NIH- DCCS)	0.24*	0.23*	0.24*	0.44**	-							
6. Updating (NIH- WMT)	0.18	0.23*	0.17	0.09	0.03	-						
7. English LEAP- Q	-0.03	0.09*	0.09	0.15	-0.03	0.19	-					
8. Other Language LEAP-Q	0.07	0.10*	0.11*	-0.18	-0.14	-0.19 _t	0.06	-				
9. English PVT (NIH)	0.21	0.24*	0.22*	0.22*	0.25*	0.17	0.24*	-0.17	-			
10. Spanish PVT (NIH)	0.05	0.02	0.07	0.07	0.20 _t	-0.10	-0.08	0.21 _t	0.16	-		
11. ACT scores	0.06	-0.01	0.06	0.33**	0.36**	0.35**	0.12	-0.08	0.39**	-0.07	-	
12. Cumulative GPA	0.12*	0.09	0.01	0.18	0.27*	0.14	-0.03	0.03	0.18	-0.03	0.35**	-

Note. The sample size for bivariate correlations varies for self-report and direct measures, with a sample size of 430 for self-report measures and 83 for direct measures; $t < .10$, * $p < .05$, ** $p < .01$

Research Question #1: Is Language Brokering Associated with Academic Achievement?

To answer the first research question, a series of OLS regressions were conducted to examine the relation between being language broker status and academic achievement. The association between brokering status and academic achievement was estimated separately for Latinos, the NIH subset of Latinos, and non-Latinos. The top half of Table 10 presents results for models with brokering defined in terms of students' current experience, and the bottom half shows findings for models where brokering status was based on whether students ever translated for others. Only 2 of the 6 regression models for current brokers were found to be significant, where current broker status was negatively associated with ACT scores among Latinos and the NIH subsample. However, when models for the Latino and NIH subsamples included socioeconomic status (SES) indicators, native language, and generation status as covariates, current broker status was no longer associated with ACT scores, $t(159) = -1.39$, $B = -1.00$, $p = .17$; $t(70) = -1.02$, $B = -1.00$, $p = .31$. In short, currently brokering was not related to Latinos' aptitude for success in higher education.

Table 10. Regression Models Testing the Link between Language Broker Status and Academic Achievement

	t	df	B	p-value
Current Brokering				
Non-Latino Subsample				
1. Brokering and ACT Scores	-1.89	273	-1.13	<i>t</i>
2. Brokering and college GPA	0.13	273	0.02	
Latino Subsample				
3. Brokering and ACT Scores	-3.00	171	-2.09	**
4. Brokering and college GPA	-1.19	171	-0.14	
NIH Subsample				
5. Brokering and ACT Scores	-2.49	78	-2.22	*
6. Brokering and college GPA	-1.19	78	-0.17	
Ever Brokering				
Non-Latino Subsample				
7. Brokering and ACT Scores	-1.40	261	-0.64	
8. Brokering and college GPA	0.08	261	0.01	
Latino Subsample				
9. Brokering and ACT Scores	-3.63	165	-2.09	***
10. Brokering and college GPA	-1.71	165	-0.16	<i>t</i>
NIH Subsample				
11. Brokering and ACT Scores	-3.38	79	-2.58	**
12. Brokering and college GPA	-1.92	79	-0.26	<i>t</i>

Note. *t* $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Next, an additional 6 regression models tested whether ever being classified as a language broker at any point in development (i.e., “ever broker” status) was associated with academic achievement. Two of the 6 models were significant at a conventional level. Similar to the current brokering models, ever brokering was related to lower ACT scores in a bivariate regression (see models 9 and 11 in Table 10), accounting for 11% of the variance in ACT scores. For the Latino subsample, this finding held with the inclusion several covariates, including SES, generation status, and native language, $t(153) = -2.01$, $B = -1.22$, $p < .05$; $R^2 = .19$, $F(4,144) = 8.44$, $p < .001$. With the inclusion of all covariates in the model for the NIH subset, the relation between ever brokering and ACT

scores was attenuated to a trend finding, $t(71) = -1.78$, $B = -1.60$, $p = .08$. Lastly, there were two results at a trend level for college GPA, which was negatively linked to ever brokering for the larger Latino sample and the smaller NIH Latino sample (see models 10 and 12 in Table 10). These trend findings did not hold with the inclusion of covariates. In sum, there was little support for an association between language brokering at any point in development and Latinos' aptitude for success in higher education, above and beyond lower socioeconomic status, not being a native English speaker, or having lower generational status.

In summary, 4 of the 12 regressions models tested to answer the first research question revealed differences in academic achievement by broker status, but these findings became non-significant or fell to a trend level when covariates were introduced. The one exception was that the linkage between ever brokering and ACT scores among Latinos held when controlling for family characteristics. This suggests that there was no overall association between brokering and academic achievement for emerging adults from Latino backgrounds. In addition, none of the models for non-Latinos were significant at a conventional level.

Research Question #2: Is Language Brokering Linked with Executive Functions?

To address the second research question, 18 regression models were estimated to evaluate the association between emerging adults' language broker status and executive functions. In the Latino subsample, the model predicting lower shifting skills from ever brokering was significant at a trend level (see model 14 in Table 11). However, with the inclusion of covariates, the overall model was no longer significant at a conventional level, $R^2 = .07$, $F(6,153) = 1.83$, $p < .10$, and interestingly, the coefficient on brokering

became significant at a conventional level $t(153) = 2.53$, $B = .21$, $p < .05$. In addition, one model estimated with the NIH subset of Latinos revealed a negative link between ever brokering and updating skills that was significant at a trend level (see Table 11, model 18). However, with covariates, the model overall was not significant, $R^2 = .08$, $F(6,71) = 1.03$, $p = .41$.

For non-Latinos, there were two models out of 9 models tested that were significant at a conventional level for current brokers. The one trend finding relating non-Latinos' brokering to inhibiting skills (see Table 11, model 1) became non-significant with the inclusion of a host of covariates, $t(265) = -1.56$, $B = -.14$, $p = .12$. Among non-Latinos, those who did not currently broker reported significantly higher shifting and updating scores (see models 2 and 3 in Table 11). The model linking non-Latinos' current brokering with shifting skills became a trend finding when all 6 covariates were entered into the model, $t(265) = -1.85$, $B = -.19$, $p = .07$. However, the second model predicting non-Latinos' updating skills was significant in a bivariate regression, $t(265) = -2.77$, $B = -.29$, $p < .01$, accounting for 2% of the variance. This model also remained significant overall with the inclusion of covariates, $R^2 = .06$, $F(6, 265) = 2.82$, $p < .05$. Although language brokering was not related to EFs on the whole, there was some indication of language brokering posing a risk to non-Latinos' updating skills, above and beyond that of SES, native language, and generation status.

Table 11. Regression Models Linking Language Broker Status and Executive Functions

	t	df	B	p-value
Current Brokering				
Non-Latino Subsample				
1. Brokering and Inhibiting	-1.82	273	-0.16	<i>t</i>
2. Brokering and Shifting	-2.30	273	-0.23	*
3. Brokering and Updating	-2.99	273	-0.30	**
Latino Subsample				
4. Brokering and Inhibiting	-0.44	171	-0.04	
5. Brokering and Shifting	-0.12	171	-0.11	
6. Brokering and Updating	-0.69	171	-0.06	
NIH Subsample				
7. Brokering and Inhibiting	-0.44	77	-0.52	
8. Brokering and Shifting	-1.37	78	-2.29	
9. Brokering and Updating	-1.01	78	-2.86	
Ever Brokering				
Non-Latino Subsample				
10. Brokering and Inhibiting	-1.72	261	-0.12	<i>t</i>
11. Brokering and Shifting	-1.71	261	-0.13	<i>t</i>
12. Brokering and Updating	-1.13	261	-0.09	
Latino Subsample				
13. Brokering and Inhibiting	-0.82	165	-0.06	
14. Brokering and Shifting	-1.64	165	-0.12	<i>t</i>
15. Brokering and Updating	-1.41	165	-0.11	
NIH Subsample				
16. Brokering and Inhibiting	-0.15	78	-0.17	
17. Brokering and Shifting	-0.95	79	-1.49	
18. Brokering and Updating	-1.72	79	-4.56	<i>t</i>

Note. *t* $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Four of the nine models examining EFs uncovered differences that were significant at a trend level, based on brokering at any point in development. Non-Latinos who never brokered reported marginally greater inhibiting and shifting skills (see Table 11, models 10 and 11). However, these models became non-significant with the inclusion of covariates.

In sum, 2 of the 18 models conducted yielded significant differences in EFs between brokers and non-brokers. Only one of these models held with the inclusion of covariates, suggesting that although brokering does not present an overall risk to EF, there was evidence that current brokering in college posed a risk to non-Latino bilinguals' updating skills.

Research Question #3: Are Executive Functions Related to Academic Performance?

To answer the third research question, 72 regression models tested for the link between EFs and academic achievement. There were 36 models run for current brokers and 36 estimated for ever brokers. Within each group, there were 3 sets of models run for each subsample (i.e., Latinos (24 models), subset of Latinos with NIH measures (24 models), and non-Latinos (24 models)). Within each of these sets, there were 2 sets of models run separately for NIH measures and self-report measures of EFs. Within each of these subsets, there were models run separately for each of three EF constructs, and each model was conducted twice – once predicting ACT and once predicting GPA scores. This means that 12 models were conducted for each subsample based on current brokering practices (i.e., 36 models in total for current brokering, see Table 12), and 36 additional models tested for differences based on being a broker at any point across development (see Table 13).

I will first discuss the significant findings among the regression models linking EFs to academic achievement for those who currently brokered or did not currently broker. Six of the 36 models, or approximately 17% of the models, linked EFs with the academic achievement of this bilingual population. Within the Latino subsample, only current non-brokers' self-reported updating skills were significantly associated with a

greater college GPA in a bivariate regression (see Table 12, model 24), accounting for 5% of the variance. This finding also held with the inclusion of covariates, $R^2 = .12$, $F(6,125) = 2.35$, $p < .05$. In the non-Latino subsample, self-reported inhibiting skills had a marginally positive relation with current non-brokers' college GPA (see Table 12, model 4). This model did not hold when a host of covariates were entered into the model. In general, EFs was not linked to academic achievement when defining brokering in terms of students' current experience. However, there was a positive relation between updating skills and college GPA for Latinos who do not currently broker. In general, self-reported measures of EFs were not strongly linked with academic achievement, with only 1 of the 24 models tested for current brokers and non-brokers yielding significant findings.

Table 12. Regression Models Linking Executive Functions with Academic Achievement, Depending on Current Broker Status

	t	df	B	p-value
Non-Latino Subsample				
1. Current brokers' Inhibiting and ACT	1.12	27	1.28	
2. Non-brokers' Inhibiting and ACT	0.59	244	0.28	
3. Current brokers' Inhibiting and GPA	0.5	27	0.12	
4. Non-brokers' Inhibiting and GPA	1.86	244	0.19	<i>t</i>
5. Current brokers' Shifting and ACT	0.39	27	0.41	
6. Non-brokers' Shifting and ACT	-1.06	244	-0.42	
7. Current brokers' Shifting and GPA	0.53	27	0.12	
8. Non-brokers' Shifting and GPA	0.05	244	0.01	
9. Current brokers' Updating and ACT	0.56	27	0.51	
10. Non-brokers' Updating and ACT	0.21	244	0.09	
11. Current brokers' Updating and GPA	0.52	27	0.14	
12. Non-brokers' Updating and GPA	0.86	244	0.09	
Latino Subsample				
13. Current brokers' Inhibiting and ACT	0.07	33	0.08	
14. Non-brokers' Inhibiting and ACT	0.48	136	0.35	
15. Current brokers' Inhibiting and GPA	-0.34	33	-0.08	
16. Non-brokers' Inhibiting and GPA	1.52	136	0.18	
17. Current brokers' Shifting and ACT	1.09	33	1.26	
18. Non-brokers' Shifting and ACT	0.99	136	0.69	
19. Current brokers' Shifting and GPA	0.05	33	0.01	
20. Non-brokers' Shifting and GPA	0.48	136	0.06	
21. Current brokers' Updating and ACT	0.84	33	0.88	
22. Non-brokers' Updating and ACT	1.62	136	1.10	
23. Current brokers' Updating and GPA	-1.05	33	-0.26	
24. Non-brokers' Updating and GPA	2.55	136	0.28	*
NIH Subsample				
25. Current brokers' Inhibiting and ACT	1.46	24	0.19	
26. Non-brokers' Inhibiting and ACT	2.62	51	2.62	**
27. Current brokers' Inhibiting and GPA	1.01	24	0.03	
28. Non-brokers' Inhibiting and GPA	1.15	51	0.02	
29. Current brokers' Shifting and ACT	2.04	24	0.16	*
30. Non-brokers' Shifting and ACT	2.37	52	0.18	*
31. Current brokers' Shifting and GPA	0.47	24	0.01	
32. Non-brokers' Shifting and GPA	2.38	52	0.03	*
33. Current brokers' Updating and ACT	0.41	24	0.02	
34. Non-brokers' Updating and ACT	3.37	52	0.14	**
35. Current brokers' Updating and GPA	0.14	24	0.00	
36. Non-brokers' Updating and GPA	1.19	52	0.01	

Note. *t* $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Notably, the majority of significant models linking EFs with academic success were using the observed EFs measures administered to the NIH subsample. In particular, all three aspects of observed EFs were significantly associated with current non-brokers' ACT scores (see Table 12, models 26, 30, & 34). In examining the link between Latino non-brokers' observed inhibiting skills and ACT scores accounted for 17% of the variance in a bivariate regression, and this model held with the inclusion of a host of covariates, $R^2 = .39$, $F(6,44) = 3.85$, $p < .01$. However, with the addition of covariates non-brokers' shifting skills were no longer related to their ACT scores, $t(45) = 1.19$, $B = .10$, $p = .24$. Similar to inhibiting skills model, the association between updating skills and ACT performance accounted for approximately 19% of the variance in a bivariate regression. The overall model also remaining significant with the inclusion of covariates, $R^2 = .40$, $F(6,45) = 4.07$, $p < .01$. In summary, direct measures of inhibiting and updating are significantly associated with Latino non-brokers' preparedness for higher education.

There were two additional findings that related the shifting aspect of EFs with Latinos' academic achievement. Similar to non-brokers, Latino current brokers' shifting skills were positively linked to their ACT scores (see Table 12, models 29). Shifting skills continued to be linked to Latino current brokers' ACT scores with covariates, $t(17) = 2.09$, $B = .20$, $p < .05$, but the overall model became insignificant, $R^2 = .40$, $F(7,17) = 1.23$, $p = .36$. In addition, shifting skills were associated with higher college GPA for Latinos who did not currently broker (see Table 12, models 32), but this finding did not hold with covariates, $t(45) = 1.17$, $B = .01$, $p = .24$. This means that shifting is not meaningful for both Latino brokers' and non-brokers' achievement in college, above and beyond their SES, native language, and generation status.

Next, I analyzed the relation between EFs and academic achievement depending on one's ever brokering status. Five of the 36 models tested were significant at a conventional level. For Latinos, none of the self-reported EFs indices were significantly related to their academic achievement. The single trend finding associating inhibiting skills with non-Latino non-brokers' college GPA (see Table 13, model 4) became non-significant when covariates were added to the model, $t(197) = 1.49$, $B = .17$, $p = .14$, suggesting that inhibiting skills do not predict non-Latino non-brokers' college performance.

Most of the significant models for ever and never brokers linked observed EFs with ACT scores. Similar to current non-brokers, all observed indices of EFs were positively linked to greater ACT scores for Latinos who never brokered (see Table 13, models 26, 30, & 34). The association between Latino non-brokers' inhibiting skills and ACT scores did not hold, including a host of covariates, $t(32) = 1.24$, $B = .15$, $p = .22$. The link between shifting and Latino non-brokers' ACT scores also became non-significant with the addition of covariates, $t(32) = 1.10$, $B = .10$, $p = .27$. Originally accounting for 21% of the variance in a bivariate regression, updating skills was related to Latino non-brokers' ACT scores, $t(32) = 2.50$, $B = .14$, $p < .05$. The overall model also remained significant with the inclusion of covariates, $R^2 = .50$, $F(6,32) = 4.43$, $p < .01$. In sum, direct measures of updating skills were associated with Latino non-brokers' greater preparedness for entering college, above and beyond SES, native language and generation status.

Table 13. Regression Models Linking Executive Functions with Academic Achievement, Depending on Ever Broker Status

	t	df	B	p-value
Non-Latino Subsample				
1. Ever brokers' Inhibiting and ACT	1.54	54	1.38	
2. Non-brokers' Inhibiting and ACT	0.61	205	0.31	
3. Ever brokers' Inhibiting and GPA	0.27	54	0.05	
4. Non-brokers' Inhibiting and GPA	1.82	205	0.21	<i>t</i>
5. Ever brokers' Shifting and ACT	0.79	54	0.63	
6. Non-brokers' Shifting and ACT	-0.70	205	-0.31	
7. Ever brokers' Shifting and GPA	0.15	54	0.02	
8. Non-brokers' Shifting and GPA	0.19	205	0.02	
9. Ever brokers' Updating and ACT	0.84	54	0.60	
10. Non-brokers' Updating and ACT	0.42	205	0.18	
11. Ever brokers' Updating and GPA	0.31	54	0.04	
12. Non-brokers' Updating and GPA	1.07	205	0.11	
Latino Subsample				
13. Ever brokers' Inhibiting and ACT	-0.15	54	-0.14	
14. Non-brokers' Inhibiting and ACT	0.24	109	0.2	
15. Ever brokers' Inhibiting and GPA	-0.24	54	-0.04	
16. Non-brokers' Inhibiting and GPA	0.95	109	0.13	
17. Ever brokers' Shifting and ACT	-0.16	54	-0.15	
18. Non-brokers' Shifting and ACT	1.13	109	0.94	
19. Ever brokers' Shifting and GPA	0.08	54	0.01	
20. Non-brokers' Shifting and GPA	0.12	109	0.02	
21. Ever brokers' Updating and ACT	0.33	54	0.27	
22. Non-brokers' Updating and ACT	1.37	109	1.12	
23. Ever brokers' Updating and GPA	-0.13	54	-0.02	
24. Non-brokers' Updating and GPA	1.43	109	0.20	
NIH Subsample				
25. Ever brokers' Inhibiting and ACT	2.43	37	0.22	*
26. Non-brokers' Inhibiting and ACT	2.21	39	0.26	*
27. Ever brokers' Inhibiting and GPA	0.92	37	0.02	
28. Non-brokers' Inhibiting and GPA	1.22	39	0.02	
29. Ever brokers' Shifting and ACT	1.75	38	0.12	<i>t</i>
30. Non-brokers' Shifting and ACT	2.54	39	0.20	*
31. Ever brokers' Shifting and GPA	0.47	38	0.01	
32. Non-brokers' Shifting and GPA	2.35	39	0.03	*
33. Ever brokers' Updating and ACT	0.78	38	0.03	
34. Non-brokers' Updating and ACT	2.99	39	0.15	**
35. Ever brokers' Updating and GPA	0.00	38	0.00	
36. Non-brokers' Updating and GPA	1.23	39	0.01	

Note. *t* $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Three additional models linked direct measures of EFs with Latinos' academic achievement. In particular, the inhibiting and shifting skills were related to Latino ever brokers' ACT scores (see Table 13, models 25 and 29). With the inclusion of covariates, the overall model predicting ACT scores from inhibiting scores was non-significant, $R^2 = .31$, $F(7, 30) = 1.44$, $p = .24$. Similarly, when covariates were included in the model predicting ACT scores from Latino ever brokers' shifting skills became non-significant, $R^2 = .26$, $F(7, 31) = 1.21$, $p = .33$. EFs do not seem to be related to greater academic success for Latino ever brokers. Lastly, the relation between Latino non-brokers' shifting skills and college GPA (see Table 13, model 32) became non-significant when covariates were introduced to the model, $t(32) = 0.98$, $B = .01$, $p = .33$. In synthesis, direct measures of EFs were not significantly associated with Latino ever brokers' ACT scores or never brokers' college GPA, when analyses controlled for SES, native language, and generation status.

Taken together, 11 of the 72, or roughly 15%, of the models that were tested yielded significant findings. Among those findings that held with covariates, updating appears to be a meaningful predictor of Latino non-brokers' academic success in college. Updating was linked with current and ever non-brokers' ACT scores, accounting for a host of covariates. In addition, self-reported updating skills were associated with current non-brokers' higher college GPA scores.

Research Question #4: Do Executive Functions Mediate the Relation between Language Brokering Status and Academic Success?

To address the fourth research question, a series of bootstrapped mediation models were performed, given contemporary recommendations (e.g., Hayes, 2009, 2012;

Hayes, Preacher, & Myers, 2011; Zhao, Lynch, & Chen, 2010). This was conducted with non-imputed data, as bootstrapping is not compatible with imputed data (Hayes, 2015).

In general, bootstrapping tests mediation by using the original sample of N cases as a “population reservoir” that will supply the computer with a large number of random samples, in this case, 5,000 samples, using replacement (Mallinckrodt, Abraham, Wei, & Russell, 2006). With each draw, there is an equal likelihood of any case being chosen. The indirect effect is estimated for each of the bootstrap samples, using the empirical distribution as the confidence interval of the indirect effect (Preacher & Hayes, 2004, 2008). When this confidence interval does not include zero, one can be confident that the indirect effect is significantly different from zero and reject the null hypothesis (Hayes, 2012).

Today, statisticians and researchers alike recognize that bootstrapping is a powerful and valid statistical tool when testing mediation (Kenny, 2008; Williams & MacKinnon, 2008). Instead of testing a succession of hypothesis tests consisting of component pathways that capture the effect, bootstrapping estimates the indirect effect in an empirical fashion (Hayes, 2009) and decreases the likelihood of a Type II error occurring (Baron & Kenny, 1986). Unlike the Sobel test, bootstrapping does not assume the sampling distribution of this indirect effect is normal, which can be a common problem for studies with fewer than 400 participants like the follow-up sample in the present study. Thus, bootstrapping was deemed the most suitable approach to test these mediation models (Hayes, 2009; Kenny, 2008; Williams & MacKinnon, 2008).

The present series of mediation models tested whether relation between language broker status and academic achievement could be explained by one’s executive functions.

Language broker status was the independent variable in all of the mediation models for all subsamples. Both self-reported and direct measures of EFs were explored as mediators. Dependent variables indexing academic achievement consisted of students' high school ACT scores as well as their cumulative college GPA.

In total, 36 mediation models were conducted, specifying model 4 in the Process macro for SPSS (Hayes, 2013). First, 12 total models were run among the Latino subsample, with one of two possible independent variables, either current or ever being classified as a language broker. All three aspects of self-reported EFs were mediators, and either ACT scores or college GPA was the dependent variable. Next, 12 mediation models were conducted for the NIH subset of Latino bilinguals, with the same two independent variables, three direct measures of EFs as mediators, and the same two dependent variables. For the non-Latino subsample, 12 mediation models were conducted with one of two possible independent variables, including the same two possible independent variables, three different self-reported mediators and two dependent variables.

Nearly all of the mediation models, 35 of the 36 (i.e., 97.2%), included zero within the confidence intervals of the indirect effects. Only one of the mediation models was significant, in which the null hypothesis could be confidently rejected. In this model, the EFs of non-Latinos, who did not currently broker, appeared to explain the relation between language brokering status and academic success in one circumstance. This mediation model was marginally significant, when all three aspects of EFs were included as mediators in the model (see Figure 9). Specifically, non-Latino non-brokers' self-reported shifting skills marginally explained the link between not being a current broker

and ACT scores. Most importantly, the confidence intervals of the total indirect effect excluded zero (indirect estimated effect = 0.22, SE = 0.14, 95% CI lower to upper = 0.01 to 0.60). Yet, once the two other aspects of EFs were excluded as mediators from the mediation model, the B path, (coeff = -0.31, SE = 0.38, $p = .42$) and total indirect effect was no longer significant, (indirect estimated effect = 0.08, SE = 0.09, 95% CI lower to upper = -0.07 to 0.10). Therefore, the initial finding was likely a false positive that occurred due to chance (i.e., $p < .05$). Additionally, it does not seem likely that greater shifting skills would lead to lower ACT scores, as prior findings in hypothesis 3 suggest a positive relation between shifting skills and ACT scores (see models 29 & 30 in Table 12 and Table 13). In short, the mediation found in Figure 9 did not hold with further analyses, and is likely due to Type I error, where there was an indication of a false positive finding (i.e., Type I error).

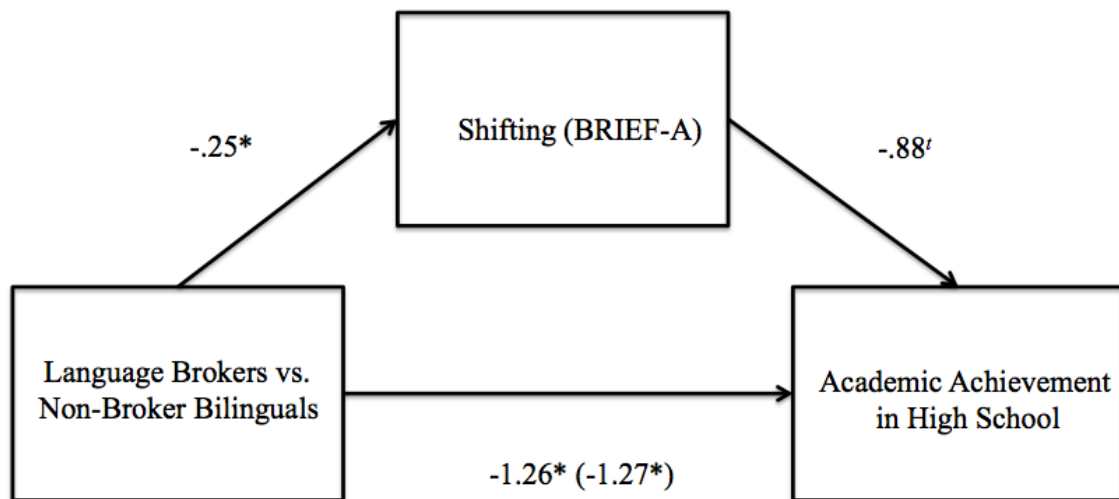


Figure 9. Trending indirect effect of non-Latinos' current language brokering status on high school ACT scores, as mediated by the shifting aspect of executive functions
Note. * $p < .05$, ** $p < .01$. *** $p < .001$.

Research Question #5: Does English Language Proficiency Moderate the Link between Executive Functions and Academic Achievement

The fifth research question is important because the inclusion of students' language proficiency skills were hypothesized to strengthen the link between EFs and academic scores. In particular, it was expected that greater English language proficiency coupled with better EFs together would improve language brokers' academic success. To address this fifth research question, 120 unique multiple regression models were conducted. Specifically, 24 models were tested for the Latino subsample, 6 for current brokers, 6 for current non-brokers, 6 for ever brokers, and 6 for never brokers. Seventy-two models were conducted for the NIH subset, due to the multiple indices of EFs and English language proficiency measured for those participants. In short, 18 models were run for current brokers, 18 for current non-brokers, 18 for ever brokers, and 18 for never brokers. In the similar fashion, 24 models were tested for the non-Latino subsample.

For each model, all independent variables indexing English language proficiency and executive functions were first centered. This was done for the purpose of creating interaction terms. To do so, descriptives were conducted, and the mean of each independent variable was subtracted from the value of that particular variable in order to create a centered variable. Next, interaction terms were created for each possible combination of English language proficiency and EFs variables (e.g., LEAP-Q aggregate by BRIEF-A inhibiting subscale, English Picture Vocabulary Test by NIH Dimensional Change Card Sort task; Aiken & West, 1991). Each multiple regression model contained three independent variables predicting students academic success: a centered EF variable, a centered English language proficiency variable, and an interaction term.

For the Latino subsample, one trend finding was revealed among the 24 models conducted to explore the interaction between English language proficiency skills and EFs on academic success. Interaction effects for Latino brokers were explored first, followed by those for Latino non-brokers. A marginal interaction effect between English language proficiency and inhibiting skills predicting college GPA was revealed among those Latino brokers who ever brokered, $t(52) = 1.71$, $B = .35$, $p = .09$. This marginal interaction was further probed, and it was revealed that when Latino brokers have lower English language proficiency, the relation between inhibiting skills and cumulative GPA is significant at $p = .10$ ($t(53) = 1.64$, $B = .31$). That is, there was somewhat marginal evidence that having lower English language proficiency moderated the inverse relation between EFs and academic performance in college for Latino brokers (See Figure 10). It is important to point out that this finding was not significant at a conventional level, $p < .05$. Therefore, it is most likely that this one interaction effect found among 120 models tested was likely a false positive finding. The rationale behind disregarding this interaction effect depicted in Figure 10 is that lesser inhibition coupled with lesser language proficiency are not likely to improve one's academic performance in college.

There was no additional evidence for an interaction effect among the NIH subset nor the non-Latino subsample. Moreover, English language proficiency did not moderate the link between EFs and academic achievement for Latinos or non-Latinos.

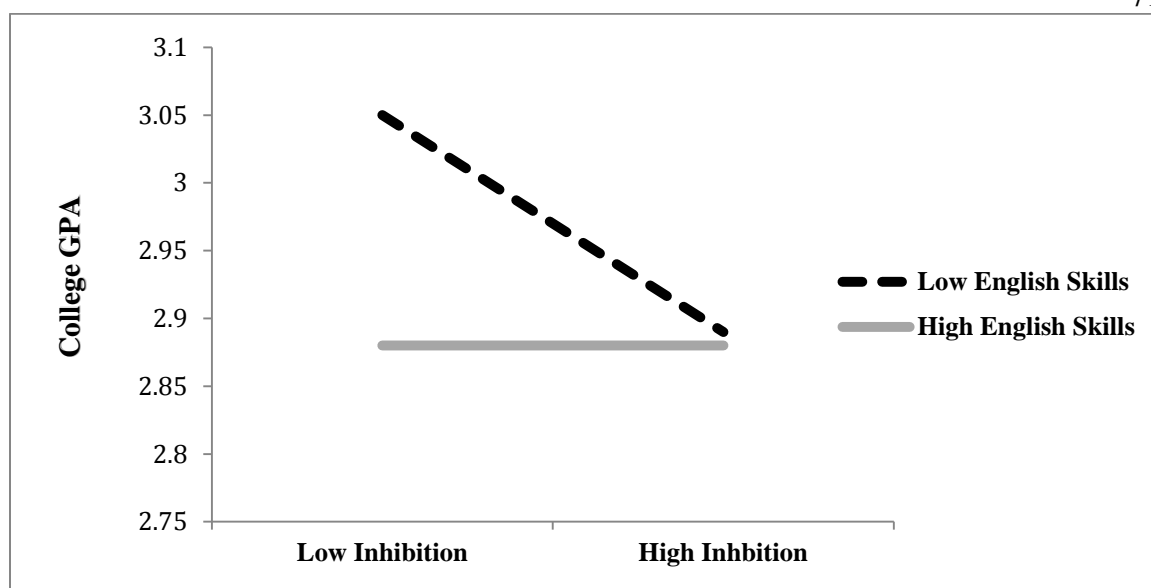


Figure 10. The simple slopes of Latino ever brokers' English language proficiency by inhibiting skills predicting college GPA

Research Question #6: The Full Moderated Mediation Model

Next, a series of moderated mediation models were conducted to address the sixth and final research question. This hypothesis included English language proficiency as a moderator within the mediation model and hypothesized that English language proficiency would help improve the overall fit of the model. To do so, 60 bootstrapped moderated mediation models were tested. Within the Process macro 2.13 for SPSS (Hayes, 2013), model 14 was specified because the English language proficiency was only anticipated to moderate the link between the mediator, EFs, and the dependent variable, academic achievement (see Figure 6).

The 60 moderated mediation models were tested across the three subsamples. In particular, 12 models were tested for the Latino subsample, with current or ever broker status as the two possible IVs, three possible interaction terms combining self-report EFs measures with self-report English proficiency measures as the moderated mediators, and

two potential dependent measures (i.e., ACT scores or college GPA). Thirty-six models were tested for the NIH subset, due to direct measures for EFs and English language proficiency. Current or ever broker status were still the independent variables, there were 9 possible interaction terms that acted as moderated mediators (see Table 14), and ACT scores and college GPA were the two possible dependent variables. Additionally, 12 moderated mediation models were tested for the non-Latino subsample.

Among the 60 unique moderated mediation models tested, none were found to be significant models. In other words, I failed to reject the null hypothesis because zero was included within the confidence intervals of the total indirect effect of x on y, at the values of the moderated mediator, which was an EFs measure X an English language proficiency measure. For instance, table 14 shows that zero was contained within all the confidence intervals of the models tested for current Latino brokers and non-brokers in the NIH subset. Similar to the moderated mediation models displayed in table 14, none of the 60 moderated mediation models yielded significant findings.

Table 14. Effect of Current Language Broker Status on the Academic Achievement of Latino students, as Mediated by Executive Functions X English Language Proficiency

Model			Bootstrapping 95% CI	
	Coeff.	SE	Lower	Upper
Cumulative College GPA				
1. Inhibiting (BRIEF-A) X English PVT	0.00	0.04	-0.11	0.07
2. Shifting (BRIEF-A) X English PVT	-0.01	0.03	-0.11	0.04
3. Updating (BRIEF-A) X English PVT	0.00	0.03	-0.03	0.09
4. Inhibiting (NIH) X LEAP-Q	0.00	0.02	-0.05	0.05
5. Shifting (NIH) X LEAP-Q	0.03	0.04	-0.02	0.17
6. Updating (NIH) X LEAP-Q	0.01	0.05	-0.04	0.18
7. Inhibiting (NIH) X English PVT	0.00	0.02	-0.06	0.04
8. Shifting (NIH) X English PVT	0.03	0.04	-0.01	0.18
9. Updating (NIH) X English PVT	0.02	0.04	-0.02	0.15

Note. Coeff. = estimated indirect effect. For every dependent variable (e.g., GPA) at least three separate moderated mediation models were conducted, depending on the possible combinations of direct and self-report measures of the mediators (i.e., EFs) and moderators (i.e., English language proficiency).

Exploring language brokering across developmental periods. Additional analyses were conducted to address all six research questions for language brokers who reported their brokering practices retrospectively. Language brokers were classified as stable, recent or early brokers depending on when they were classified as language brokers from middle childhood to late adolescence (see Appendix A). It was hypothesized that stable brokers would have the highest levels of EFs and academic achievement, followed by recent brokers, with early brokers possessing the lowest levels of EFs and academic achievement.

A total of 270 models were tested to address all 6 research questions. The large quantity of analyses conducted reflects both the multiple indices of EFs and academic achievement that were obtained for each subsample as well as the estimation of multiple models given that the independent variable was dummy coded. Planned comparison models were tested for stable and recent brokers, as they were hypothesized to have better EFs and academic achievement compared to early brokers. Twelve regression models were conducted to address the first research question, exploring whether past patterns of language brokering predicted later academic achievement. Then, 18 regression models were tested to answer the second research question, examining past brokering practices in relation to present EFs. Next, 54 regression models were conducted to address the third research question, testing whether EFs were associated with academic success for each type of broker (e.g., stable, recent, and early). For the fourth research question, 36 mediation models explored to see whether the EFs explained the relation between the type of broker they were in the past and their later academic achievement. The fifth research question entailed 90 regression models, using interaction

terms, to test whether better English language proficiency strengthened the link between EFs and academic achievement for each type of broker (e.g., stable, recent, and early). Lastly, 60 moderated mediation models were performed to see whether including English language proficiency as a moderator improved the prior mediation model for particular types of brokers.

In summary, only one of the 270 models tested was significant. Counter to expectations, it was revealed that among non-Latinos early brokers had better ACT scores than stable brokers, $t(52) = 2.48$, $B = 3.27$, $p < .05$. An additional model suggested that early brokers also had marginally better ACT scores compared to recent brokers, $t(52) = 1.74$, $B = 1.67$, $p < .10$. Contrary to my hypothesis, these findings suggest that brokering earlier in development was more beneficial than always brokering or brokering later on in development. However, it is important to consider that this is the one significant finding among 270 models. In general, the lack of significance in these past brokering models may be explained due to low power, with a maximum of 56 brokers in a given model that were divided across the three categories.

CHAPTER FIVE

DISCUSSION

Contributions

Although results from this dissertation did not provide substantial support for the hypotheses, there were notable findings and there are methodological strengths worth highlighting. First, brokering status was generally not linked to academic achievement. Second, on the whole, brokering status was not linked to executive functions. Third, even though most models did not reveal significant linkages to academic achievement from executive functions, there was evidence that direct assessment measures of executive functions explained individual differences in academic scores. Finally, there was very little support for executive functions acting as a mediator of the linkage between brokering status and academic scores, as well as little evidence for a significant moderating role for language proficiency on the association between EFs and academic achievement. Moreover, there was no evidence of moderated mediation, where the mediating role of executive functioning depended on English language proficiency. Exceptions to these overall null patterns are discussed below.

Despite the relatively little support for this dissertation's hypotheses, its methodological contributions should be underscored. First, the language brokering literature has not explored these associations among emerging adults, despite the number of children of immigrants present in higher education who also vary greatly in their success in postsecondary education (Baum & Flores, 2011). Only two studies have

examined emerging adults' language brokering. The first explored emerging adults' language brokering in relation to cultural factors (Weisskirch et al., 2011), and the second examined language brokering of emerging adults and its association with prosocial behaviors (Guan, Greenfield, & Orellana, 2014). Yet, the impact of language brokering on cognition, in particular executive functions, and academic achievement is largely unknown among emerging adults. Second, this dissertation focused on bilingual emerging adults from a wide range of backgrounds, including a large portion of individuals from Latino, Indian, and Polish families. The latter two groups have not been the focus of existing language brokering studies. Third, this dissertation collected EF data using self-report and direct assessment, both of which have been largely absent in the brokering literature.

Descriptive Portrait of Bilingual College Students

Importantly, this study was able to provide more descriptive insight into bilingual college students. Latino bilingual students will first be discussed, followed by non-Latino bilingual students. Within the full survey sample, approximately 1/3 of Latinos were brokers at some point in time. In terms of Latino brokers and non-brokers, approximately three quarters were women, reflecting a female dominant university environment (Jacob, 2002) as well as a greater number of female bilinguals (Morales & Hanson, 2005; Weisskirch et al., 2011). It was found that Latino brokers tended to be native Spanish speakers compared with their non-brokering peers, who were more likely to be native English speakers. This supports and extends Chao's (2002) finding that bilinguals tend to language broker more frequently when they are more fluent in their heritage language. Similar to extant literature (Buriel et al., 1998; Dorner, Orellana, Li-

Grining, 2007), Latino brokers also had significantly lower generation status in comparison with Latino non-brokers. In addition, Latino brokers had significantly more siblings, averaging 2 siblings in comparison to Latino non-brokers averaging between 1 and 2 siblings, which was likely due to an overall pattern of Latino immigrant families tending to have larger families (Durand, Telles, & Flashman, 2006). Lastly, Latino brokers and non-brokers were similar in that approximately 40% of Latinos were first-borns. Prior literature suggests that language brokers are more likely to be first-born children (Ponizovsky, Kurman, & Roer-Strier, 2012); however, it may be that the sample specific to this study reflects a particular cultural behavior among former Soviet Union immigrants to Israel.

In many ways, SES distinguished Latino brokers from Latino non-brokers in the present study, highlighting the heterogeneity present among the Latino bilingual population. Describing these differences in SES is a major contribution to language brokering literature, given that past studies in this area have not described the link between language brokering and SES (Buriel et al., 1998; Love & Buriel, 2007) or controlled for SES (Dorner, Orellana, & Li-Grining, 2007; Weisskirch et al., 2011). The present study found Latino brokers were raised in households with parents who had lower educational attainment. In particular, less than 20% of Latino brokers' fathers and about a quarter of their mothers pursued education beyond high school, whereas approximately 60% of Latino non-brokers' mothers and fathers attained education beyond high school. In regards to household income, Latino brokers had a relatively normal distribution of household income ranging between \$30,000-\$70,000 per year. In comparison, Latino non-brokers had a bimodal distribution, in which they tended to come from households

earning a range of \$50,000-\$70,000 or \$130,000 and above. Thus, this dissertation suggests that Latino non-brokers attending higher education may come from households with greater SES than their Latino brokering peers. These SES findings underscore how difficult it is to disentangle the effects of Latinos' language brokering from their lower SES. Future research should aim to approach such questions about language brokering with bilingual populations that are not confounded by great differences in SES.

Across the full sample, roughly 1/5 of non-Latinos were brokers. As for non-Latino brokers and non-brokers, there were a few notable differences depending on language brokering status. Although statistical comparisons were not made across Latinos and non-Latinos, the differences found among non-Latinos are consistent with the findings summarized above for Latinos. For example, non-Latino language brokers were significantly more likely to be female. In part, this may reflect the demographics of the university, yet literature corroborates that a larger number of language brokers are female (Buriel et al., 1998; Morales & Hanson, 2005; Weisskirch, 2005). Similar to prior literature, non-Latinos brokers were less likely to be native English speakers (Chao, 2002), and had significantly lower generation status compared to non-Latinos who did not broker (Buriel et al., 1998; Dorner, Orellana, Li-Grining, 2007). Aligned with the current literature, non-Latinos were remarkably similar in terms of siblings, with both non-Latino brokers and non-brokers averaging between 1 and 2 siblings (Durand, Telles, & Flashman, 2006). Contrary to the prior literature, non-Latino brokers were not more likely to be first-born children (Ponizovsky, Kurman, & Roer-Strier, 2012).

Furthermore, language brokers in the non-Latino subsample came from households with lower SES. For example, non-Latino brokers' parents had significantly

lower educational attainment, with only half of language brokers' fathers and less than 40% of their mothers pursuing education beyond high school. The distribution for non-Latinos' annual household income ranged from \$130,000 and above serving as the modal income. In comparison, non-Latino brokers' distribution of annual household income was had a lower mode ranging from \$30,000-\$50,000. These findings suggest that non-Latino brokers come from households with lower SES. Describing this discrepancy in SES for a wide range of non-Latino bilinguals, depending on broker status, also serves as a contribution to this field of research.

In synthesis, the present study contributes a more detailed portrait of SES differences for both Latino and non-Latino bilingual populations, depending on language brokering status. Regardless of ethnicity, language brokers appear to originate from households with lesser SES, in terms of parental educational attainment and annual household income. Further research is needed to test whether differences across Latinos and non-Latinos are significant.

Language Brokering and Academic Achievement

Contrary to the first hypothesis, there were generally no linkages between brokering status and academic scores; however, there was some evidence that brokering may have been disadvantageous for students' ACT scores. Among Latinos, there was a negative association between brokering status and ACT scores. This was found among the larger Latino subsample, and among the subset of Latinos with direct assessment data on executive functions. Furthermore, this was found when defining brokering status in terms of whether students were current brokers as well as when students were categorized

as ever brokers. In addition, when using the latter “ever broker” definition, brokering was marginally related to GPA in the negative direction.

In other words, Latino bilinguals who did not broker were more academically successful as college students. Alternatively, Latino language brokers had significantly lower academic achievement compared with their non-brokering peers. There was only a marginal association found among non-Latino bilingual students. That is, non-Latino bilinguals’ brokering practices were not significantly associated with their academic achievement in college or aptitude for college success at a conventional level.

The overall lack of academic achievement findings for college GPA may be attributed to the fading of academic impacts and the importance of grit. Past studies investigating the relation between language brokering and academic achievement revealed positive links during childhood (Dorner, Orellana, & Li-Grining, 2007; Orellana, 2003) and adolescence (Acoach & Webb, 2004; Buriel et al., 1998). However, this positive association may attenuate in higher education when academics become more demanding and rigorous (Perry et al., 2001; Tseng, 2004). In fact, recent literature suggests that grit, or perseverance and passion for long-term goals, may be especially critical for academic performance in higher education (Duckworth, Peterson, Matthews, & Kelly, 2007). This may explain why findings in the present study were more related to ACT scores than college GPA, as the American College Testing (ACT) exam is a timed measure that projects college success based on questions that require both fluid and crystalized intelligence. In comparison, one’s college GPA likely reflects a combination of intelligence and grit. As such, cognitive and linguistic factors may be more predictive of ACT vs. GPA.

In terms of the ACT, significant associations did emerge for Latinos students.

There was some evidence that non-broking Latino students had a greater aptitude for success in college, compared with Latino brokers. Given that Latino students in this study tended to come from lower socioeconomic status backgrounds than non-Latino students, it could also be that the combined experience of broking and low socioeconomic status may have jeopardized Latino brokers' academic performance in higher education. A long line of research has demonstrated that socioeconomic status is negatively related to academic skills (Duncan & Magnuson, 2005; Lee & Burkam, 2002; Sirin, 2005). Similarly, broking could be reflective of other disadvantages held by families, such as not being native English speakers, which could lead to a need for students to translate for their parents and academic disadvantages. Most links between broker status and academic achievement faded when controlling for SES, but not all did, suggesting that broker status was not merely a rough proxy for SES. To disentangle the roles of broking and SES, future studies should test predictions from language broking when SES is less of a confounding factor.

Another possible explanation for the negative relation between broking status and college aptitude among Latinos is that they may experience more stressors than their non-broking peers. For example, the behavioral demands and psychosocial risks associated with the lives of language brokers may compromise success in higher education for those emerging adults who broker. Past literature has shown that Latino adolescents have been found to experience behavioral demands on their time that distract from their academic performance (Fuligni, Tseng, & Lam, 1999; Tseng, 2004). Language broking may become increasingly demanding with age (Weisskirch et al.,

2011), as young adults gain more skills that may be useful to their families. As such, brokering adults may especially experience an internal conflict where they try to balance the dominant culture's emphasis on independence and autonomy with their familial obligations and responsibility to language broker (Fuligni, Tseng, & Lam, 1999; Tseng, 2004; Weisskirch, et al., 2011). In addition, past research among adolescents (Love & Buriel, 2007) and emerging adults suggests that brokering may cause undue stress and depression (Rainey et al., 2014), which are known to negatively impact academic performance in college (Hysenbegasi, Hass, & Rowland, 2005). Future longitudinal research should follow individuals from childhood through emerging adulthood to explore whether brokering experiences benefit academic performance during early development, but fade as emerging adults enter higher education.

Lastly, this finding may point to the possibility that among Latinos, being bilingual may be beneficial to one's aptitude for college, so long as one is not required to translate frequently for family and friends. Though the present study originally hypothesized that a brokering advantage might exist, in which brokers outperform non-brokering bilinguals in college, the few significant findings for the first hypothesis suggest the opposite may be the case. That is, a non-brokering academic advantage might exist among Latino bilinguals, in which not brokering is associated with greater academic gains in emerging adulthood. One recent study supported this notion, with greater frequency of language brokering negatively associated with academic performance during college (Shen & Guan, 2015). However, future investigations should continue to build upon these findings to test whether benefits of bilingualism differ across brokers vs. non-brokers in larger groups of Latinos with more socioeconomic diversity.

Language Brokering and Executive Functions

In contrast to the second hypothesis, there were generally no linkages between brokering status and executive functions. However, non-Latino bilinguals who did not broker showed some strengths in executive functions. More specifically, non-Latino bilinguals who did not currently broker reported greater shifting and updating skills. Furthermore, the latter finding held with the inclusion of a host of covariates. Among the Latino subsample, links between broker status and EFs were only found at a marginal level. Interestingly, being a non-Latino current broker was negatively related to the direct assessment of shifting and updating.

The overall absence of linkages between brokering status and executive functions suggests that broker advantage in EFs may not exist. Though there is debate, many existing studies document the profound advantage bilingual individuals have in executive functions, as a result of simply speaking two languages (Bialystok, 2009; Carlson & Meltzoff, 2008; Bialystok, Craik, & Luk, 2008). In those studies, bilinguals are compared to monolinguals. Without monolinguals in the current investigation, the testing of a bilingual advantage could not be conducted. However, it was hypothesized that there was a broker advantage in EFs, where bilingual brokers who speak two languages more often have more efficient EFs than bilingual non-brokers. Yet, most models did not suggest that brokering was significantly linked to executive functions. In the few cases where there were significant associations, brokering was related to lower executive functions.

Although prior research has shown higher academic scores among language brokers (Acoach & Webb, 2004; Buriel, et al., 1998; Dorner, Orellana, & Li-Grining, 2007; Orellana, 2003), only one study to date has tested for associations between language brokering and more specific cognitive constructs, such as executive functions (Rainey, Davidson, & Li-Grining, 2015). In general, Rainey and colleagues (2015) found that 9-year-old Spanish-English language brokers had greater cognitive flexibility, or shifting skills, compared with non-brokering bilingual children. This dissertation is the first study to assess whether there are brokering advantages in executive function among emerging adults, and it utilizes both self-report and direct assessment measures of executive functions. It may be that a broker advantage for executive functions appears in developmental periods prior to emerging adulthood. While executive functions are still malleable in emerging adulthood (Best, Miller, & Naglieri, 2011), they are most susceptible to change during early childhood (Best & Miller, 2010). In the future, research should examine whether there is a broker advantage in terms of executive functions that fades as individuals move from early childhood to emerging adulthood.

When significant associations were detected, they emerged mostly when predicting updating and shifting. Why would brokering potentially pose a threat to executive functions? According to Sweller's cognitive load theory, each individual can hold a limited amount of information in their working memory at a given time (Sweller, Ayres, & Kayluga, 2011). Bilingual brokers may experience a particularly high cognitive load, which could interfere with how readily executive functions may be utilized. In regards to their updating skills, brokers may become overwhelmed with the content they

need to translate and thus have difficulty maintaining and manipulating the information at hand. Additionally, while brokers are shifting attention from one language to another, they may not be switching their focus from one language to another in an efficient nor effective manner. One recent study revealed that bilinguals were not more efficient at switching (Weissberger, Gollan, Bondi, Clark, & Wierenga, 2015). It may be that frequent shifting between languages serves as a distractor and causes shifting skills to be less efficient. To investigate this possibility further, future bilingual studies should continue to examine not only whether a bilingual advantage exists, but also whether a non-broker advantage exists. Not accounting for such translation practice may, in part, explain the mixed findings in the “bilingual advantage” literature (Bialystok, 2009; Konnikova, 2015).

Interestingly, the present study did not detect a link between language brokering and inhibition skills. Extant research asserts that bilinguals demonstrate an advantage in the inhibiting component of executive functions (Bialystok, 2009; Bialystok & Martin, 2004; Carlson & Meltzoff, 2008). However, it may be that there is not a more specific broker advantage for bilinguals’ inhibitory control. It could also be that a broker advantage for inhibitory control exists when individuals are children, who are the focus of past bilingual studies revealing strengths in executive functions (Bialystok, 2009; Bialystok & Martin, 2004; Carlson & Meltzoff, 2008). In contrast, there may not be such an advantage present for young adults whose inhibition skills are relatively stable by emerging adulthood (Best & Miller, 2010), whereas changes in shifting and updating

have a more gradual linear trajectory that spans into early adulthood (Best & Miller, 2010).

Executive Functions and Academic Achievement

Overall, most models did not reveal significant associations between executive functions and academic achievement. The positive linkage found between brokering and academic skills when children are younger (Buriel et al., 1998; Dorner, Li-Grining, & Orellana, 2007) might not hold when academic demands increase in college (Perry et al., 2001; Tseng, 2004). Still, there was a pattern of links between direct measures of executive functions and academic scores. In particular, when defining brokering in terms of ever being a broker, there were positive relations from direct assessments of inhibiting, shifting, and inhibiting skills with ACT scores among Latino non-brokers. This pattern only held for direct measures of Latino non-brokers' updating skills, when a host of covariates were included. There were fewer links to GPA, which were associated only with Latino non-brokers' direct measures of shifting. College GPA was not related to any direct measures of language brokers' executive function skills. When turning to the non-Latino students, there were mostly null findings, but greater self-reported inhibiting skills were related to higher GPAs among non-brokers at a marginal level.

When conceptualizing brokering in terms of currently being a broker, findings were similar. However, there were two exceptions. Both observed measures of inhibiting and updating skills were significantly linked with Latino current non-brokers' ACT scores in a positive direction, when a host of covariates were included. Also the link

between Latino current non-brokers' reported updating skills and college GPA held with the addition of covariates.

Despite mostly non-significant findings with survey measures, the results based on direct assessments make a contribution to the literature. Even though the prediction of academic success from early executive functions has been studied extensively (Best, Miller, & Jones, 2009; Best, Miller, Naglieri, 2011; Bull, Espe, & Wiebe, 2008; St. Clair-Thompson & Gathercole, 2006), the literature is just beginning to estimate the association between executive functions and academic success during emerging adulthood. For example, Best, Miller, and Naglieri (2011) found moderate, positive links between executive functions and academic achievement for children from early childhood to late adolescence. This dissertation extends those findings with its detection of positive linkages between EFs and academic skills during emerging adulthood. These findings are congruent with the notion of continuous development of EFs during emerging adulthood (Best & Miller, 2010), which would lead to variance in EFs across young adults. Furthermore, a recent study (McClelland, Acock, Piccinin, Rhea, & Stallings, 2013) found that preschoolers' attention-span persistence, which likely reflects EFs, predicted reading and math performance at age 21 and completion of college by age 25, after controlling for prior school performance at age 7. It could be that early EFs explain differences in academic skills during college. Future research should continue to conduct such longitudinal studies from early childhood through emerging adulthood, so that we can more rigorously assess the causal link between executive functions and academic performance.

In addition, there are two patterns worth noting. One involves the positive association between updating and academic scores, and the other involves non-brokers. First, updating – as opposed to inhibiting or shifting – might be particularly protective for bilinguals’ academic achievement given that updating is related to academic success concurrently (St. Clair-Thompson & Gathercole, 2006) and longitudinally (Bull, Espy, & Wiebe, 2008). In essence, updating allows one to maintain several items in mind in order to accomplish more complex tasks necessary in higher education, such as reasoning, comprehension and learning (Baddeley, 2010). While there are mixed findings regarding bilinguals’ advantage in updating (Adesope, Lavin, Thompson, & Ungerleider, 2010; Bialystok, 2009), accounting for brokering status may help explain such inconsistencies. Future studies should include monolingual, brokering bilingual, and non-brokering bilingual college students to test this hypothesis.

Mediation and Moderated Mediation Models

Mediation. Given the absence of linkages between language brokering and academic achievement and between language brokering and EF, it is not surprising that the mediation analyses did not yield significant associations. None of the bootstrapped models were found to be significant. This suggests that EFs do not explain links between language broker status and academic achievement. Furthermore, a completely indirect link from language broker status to EFs, and then from EFs to academic achievement was not detected.

There are three reasons why this dissertation did not detect an indirect association between language broker status and academic achievement, or more relations between

brokering and EFs, and EFs and achievement. These explanations are similar to those outlined above for the non-significant main effects (e.g., family risks predict achievement, not language brokering; higher education is more demanding than elementary school education; grit may a larger explanatory factor of academic skills among college students). Still, it could have been that there was a completely indirect link from language brokering to EF, and then from EF to academic achievement, but it was not captured in this dissertation, on the whole. As discussed above, there was some support for an EF-academic skills linkage.

Moderated mediation. Contrary to the fifth and sixth hypotheses, the association between bilinguals' EFs and academic achievement did not depend on their English language proficiency, and there was the mediation of the link between brokering and achievement through EF did not depend on language proficiency. Greater English language proficiency among bilingual individuals was expected to strengthen the link between EFs and greater academic achievement. This hypothesis originated largely from Cummin's (1979; 2000) lower level threshold hypothesis, in which greater academic achievement among language minority students is not apparent until sufficient language proficiency, of the dominant culture, is achieved. In general, the present study was not able to confirm that the link between EFs and academic achievement depends on English language proficiency.

Given that brokering students had sufficient English language skills to attend college, it is possible that the lower threshold hypothesis was more relevant to language minority (LM) learners in earlier stages of acquiring English (Bumgarner, Martin, &

Brooks-Gunn, 2013). Future research should continue to explore particular stages in language acquisition when LM students' academic achievement is dependent on English language proficiency and how that relation changes in later stages of development.

Exploring Links with Patterns of Brokering

Additional analyses explored the six hypotheses above using brokering defined in terms of patterns across developmental periods, where stable, recent, and early brokers were the focus. Among the 270 models tested to address all six research questions, only one finding was significant at a conventional level, with one additional trend finding. The significant model found that non-Latinos early brokers had better ACT scores than stable brokers, and the marginally significant model suggested that non-Latino early brokers had better ACT scores than recent brokers. Counter to the hypotheses that predicted stable or recent brokers would experience greater academic success compared to early brokers, these results suggest that brokering earlier in development is more beneficial than always brokering or brokering later on in development. This is consistent with literature that has found links among children (Dorner, Li-Grining, & Orellana, 2007; Orellana, 2003) and adolescents' (Acoach & Webb, 2004; Buriel et al., 1998) brokering and their academic achievement. However, this finding extends these studies by suggesting that early brokering may have long-term positive effects on academic achievement into emerging adulthood. Future research should test for this association by following brokers from early childhood through young adulthood.

It is critical to interpret these findings with caution, as only one significant finding was revealed among 270 models. First, this low incidence of significance suggests that

the one significant model may be a Type I error, or a false positive finding (Tabachnick & Fidell, 2007, p. 34), as it falls below the probability value of $p < .05$. Second, this general lack of significance in these past brokering models may, in part, be explained as underpowered analyses (Cohen, 1988), with a maximum of 56 brokers in any given model, divided across three categories. A post hoc power analysis performed with G*Power version 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007) revealed that the analysis was indeed underpowered ($1-\beta = .71$; Cohen, 1988), which was not anticipated to be the case at least for non-Latino Brokers. However, there was a smaller proportion of language brokers within the non-Latino sample. In turn, a future direction for research includes examining cognitive and academic benefits related to different patterns of language brokering over time with a larger sample.

Limitations

There are some limitations in this study that are noteworthy. First, this study was limited by bilingual individuals' retrospective account of whether they ever brokered, which may be susceptible to false negative reports (Hardt & Rutter, 2004), or underreporting the incidence of brokering. A necessary future step would be to investigate such changes and stability in EFs and academic achievement among this brokering population as they actually occur during development. Still, this study served as an important first step in examining brokering practices across development in relation to cognitive and academic outcomes during emerging adulthood.

Although the inclusion of direct assessments of EFs was a strength of the current study, a second limitation is that the direct measure of executive functions, which was

created by the National Institute of Health, may require additional testing to confirm that it is a suitable index of emerging adults' EFs (Gershon et al., 2010). Erikson's Flanker task as well as the Dimensional Change Card Sort task are more commonly used among preschoolers to demonstrate marked changes in EFs that occur during early childhood. It is possible that more complex indices of EFs are needed at this developmental stage in order to yield a more nuanced picture of emerging adults' inhibiting, shifting, and updating skills (Luciana & Nelson, 1998). Better measures of EFs among emerging adults, may also allow for a more accurate comparison of EFs between brokering and non-brokering populations and possibly reveal strengths in EFs among brokers that were not uncovered in the present study. Nevertheless, Gershon & colleagues (2010) deem such measures of EFs to be an appropriate index of EFs across the lifespan.

Third, a further limitation was the use college students' college GPA as a dependent measure. Using more than one index of participants' academic achievement helped balance out the shortcomings of using college GPA as a dependent measure, and a strength of the present study was that students' released their academic records instead of using a self-report of GPA, which is commonly used in past literature (Acoach & Webb, 2004; Buriel et al., 1998). Still, future studies should use standardized achievement tests, such as the Woodcock-Johnson tests of achievement (2001), to minimize the influence of a students' major on their college GPA, where GPAs might tend to be high due to self-selection into various majors. Fourth, future research should build on the current descriptive study by statistically comparing the models estimated here, and fifth, the findings here cannot be generalized to bilingual college students across the U.S., given

the particular characteristics of this sample and university. Lastly, while the present study aimed to uncover how specific aspects EFs related to particular indices of academic achievement, future research should aim to build a structural equation model relating an overarching latent variable of EFs to an academic achievement latent variable.

Conclusion

In conclusion, despite the overall pattern of null results, the present study brings attention to three findings regarding language brokers' cognitive and academic skills. First, Latino bilinguals who brokered experienced lower academic achievement; in particular, they were less prepared to enter higher education. In turn, making translation services more available to Spanish-English speaking families may indirectly bolster Latino students' academic achievement and lessen the burden of language brokering duties. A systematic review of interpreter services available to families limited in English proficiency (LEP) found that having trained interpreters present was positively linked with patient satisfaction, quality of care, and health outcomes (Flores, 2010). However, pediatricians, in particular, report using untrained interpreters to communicate with LEP families, with patients being less likely to receive appropriate language services in regions with a high proportion of LEP families (Kuo, O'Connor, Flores, & Minkovitz, 2007). These findings in the medical context in conjunction with the lower academic preparedness among Latino language brokers in college signal the profound need for more trained interpreters in a variety of settings that include both health and higher educational institutions.

Second, this study revealed that non-Latinos who did not broker had better updating skills. This highlights the greater higher-order processing among non-broking bilinguals. It could be that being bilingual with language brokering obligations is a risk, and being bilingual without brokering duties is protective. Past research supports that bilinguals, in general, show advantages in the inhibiting and shifting components of EFs (Bialystok, 2009) because they switch between languages often. The present study extends this literature and suggests that language brokers, a special group of bilinguals who translate frequently for family, may have lesser updating skills. A possible explanation for this is that translating regularly may burden the EFs network, in particular updating skills, by taxing the mind with an overwhelming amount of information (Sweller, Ayres, & Kayluga, 2011). In turn, accounting for bilinguals' brokering practices in the future EFs research may, in part, explain why a bilingual advantage has not been evident for updating skills.

Lastly, Latino bilinguals' EFs positively predicted their preparedness for college. This last contribution to literature suggests that Latino bilingual students may show both greater cognitive skills and academic skills in higher education. To the extent that preschool EFs predicts EFs in emerging adulthood, schools should prioritize the implementation of EFs interventions, such as *Tools of the Mind (Tools)*, that help foster and sustain EFs (Bedrova & Leong, 2007; Diamond & Lee, 2011). *Tools* takes a Vygotskian approach to developing EFs through social interaction. Similar to other EFs interventions, *Tools* focuses on developing and sustaining EFs skills during early childhood. Given the findings among young adults here, adapting such interventions to

be suitable for bilinguals in late adolescence and emerging adulthood may be a promising approach to augmenting Latinos' academic success in higher education.

APPENDIX A

TYPES OF LANGUAGE BROKERS AND PERIODS OF BROKERING

Periods of Language Brokering

Language Broker Type	Middle Childhood ages 4-8	Early Adolescence ages 9-13	Late Adolescence ages 14-18
Stable	X	X	X
Recent	X	X	X X X
Early	X X	X X	

APPENDIX B

RESEARCH QUESTIONS IN RELATION TO AVAILABLE MEASURES

Research Question #1: Frequency of language brokering predicting Latino emerging adults' academic success.



Note. Latino emerging adults reported on language brokering practices currently as well as retrospectively for the age ranges of 4-8 years, 9-13 years, and 14-18 years.

Research Question #2: Frequency of language brokering predicting Latino emerging adults' executive functions.

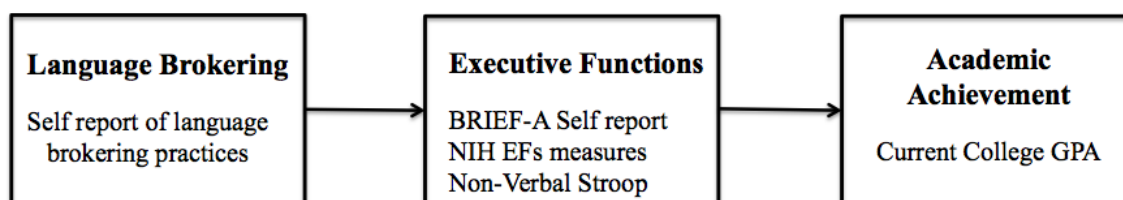


Note. Latino emerging adults reported on language brokering practices currently as well as retrospectively for the age ranges of 4-8 years, 9-13 years, and 14-18 years. Latino emerging adults' self-reported EFs were indexed using the BRIEF-A. A select group of Latinos brokers and non-brokers' EFs were measured using a series of behavioral tasks from the NIH toolbox including: the Flanker Inhibitory Control and Attention Test, List Sorting Working Memory Test, the Dimensional Change Card Sort Test, and the Pattern Comparison Processing Speed Test. The Non-Verbal Stroop, an EEG task measuring Latino emerging adults' EFs, was also administered to this same select group.

Research Question #3: Executive functions predicting Latino emerging adults' academic achievement.

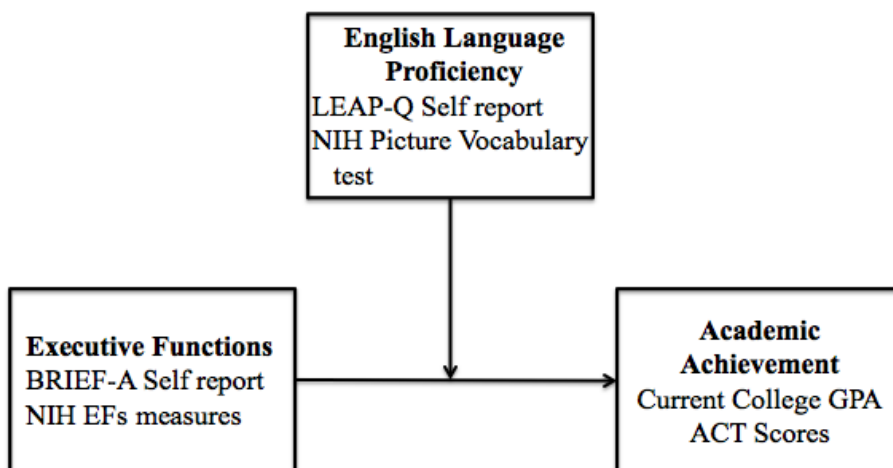


Research Question #4: Latino emerging adults' executive functions mediating the link between frequency of language brokering and college academic achievement.



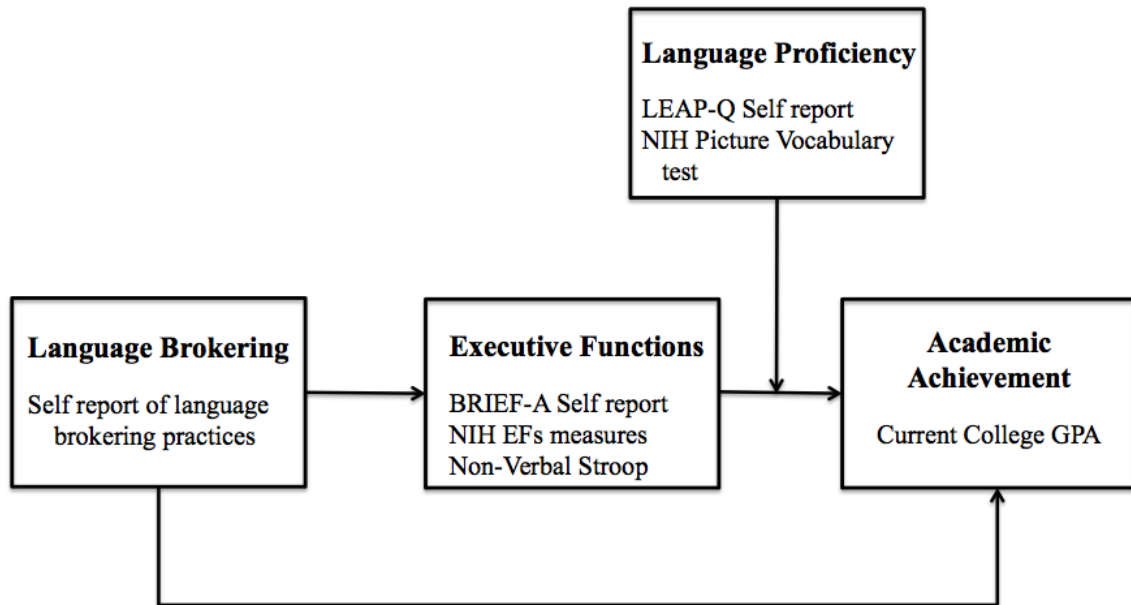
Note. Latino emerging adults reported on language brokering practices currently as well as retrospectively for the age ranges of 4-8 years, 9-13 years, and 14-18 years. Latino emerging adults' self-reported EFs were indexed using the BRIEF-A. A select group of Latinos brokers and non-brokers' EFs were measured using a series of behavioral tasks from the NIH toolbox including: the Flanker Inhibitory Control and Attention Test, List Sorting Working Memory Test, the Dimensional Change Card Sort Test, and the Pattern Comparison Processing Speed Test. The Non-Verbal Stroop, an EEG task measuring Latino emerging adults' EFs, was also administered to this same select group.

Research Question #5: English language proficiency moderating the relation between emerging adults' EFs and academic achievement.



Note. Latino emerging adults' reported on their language proficiency using a subscale of the LEAP-Q. A select sample of Latino young adults was administered a direct measure of language proficiency from the NIH toolbox called the Picture Vocabulary test.

Research Question #6: Proposed full model of the link between Latino emerging adults' frequency of brokering and academic achievement in college.



Note. Emerging adults reported on their current and past language brokering practices, which were measured in terms of the frequency with brokered for particular people, the number of items they brokered, and the places in which they brokered. Both self-report and direct measures of participants' EFs and language proficiency were collected. Participants' college GPA was used to index their academic performance.

APPENDIX C

LANGUAGE BROKERING QUESTIONNAIRE

Participants were first asked to indicate if they translated for other people from ages 4-8 years, 9-13 years, 14-18 years, or currently. If they answered yes to any of the four time periods, then they were asked to answer the following questions about their language brokering practices for each respective time period, in which they indicated that they did translate.

Frequency of Translating for People

Who have you translated for and how often do you translate for them?

a) Your mother	Every day	Once a week	Just sometimes	Never
b) Your father	Every day	Once a week	Just sometimes	Never
c) A grandparent	Every day	Once a week	Just sometimes	Never
d) Younger brothers or sisters	Every day	Once a week	Just sometimes	Never
e) Older brothers or sisters	Every day	Once a week	Just sometimes	Never
f) Other family	Every day	Once a week	Just sometimes	Never
g) Teachers	Every day	Once a week	Just sometimes	Never
h) Friends	Every day	Once a week	Just sometimes	Never
i) Other people (who?)	Every day	Once a week	Just sometimes	Never

Places Where Translation Occurred

Where have you translated? Please select ALL the places that apply to you.

- a) At home
- b) At school
- c) Doctor's office
- d) Dentist's Office
- e) Stores
- f) Restaurants
- g) On the street
- h) Parent-teacher conferences
- i) Other places _____.

Items Translated

What kinds of things have you translated? Please select ALL the things that apply to you.

- a) letters
- b) homework
- c) report cards
- d) other school information
- e) the mail
- f) bills
- g) bank statements
- h) legal documents
- i) phone calls
- j) conversations
- k) television shows
- l) movies
- m) radio shows

- n) the newspaper
- o) words
- p) other stuff _____.

APPENDIX D

BEHAVIORAL RATING INVENTORY OF EXECUTIVE FUNCTIONS- ADULT

VERSION (BRIEF-A) QUESTIONNAIRE

Instructions: During the past month, how often has each of the following been a problem?

Never

Sometimes

Often

Working Memory (Updating) subscale*:

1. I have trouble concentrating on tasks (such as chores, reading, or work). [#4]
2. I have trouble with jobs or tasks that have more than one step. [#11]
3. I forget what I am doing in the middle of things. [#17]
4. I have trouble staying on the same topic when talking. [#26]
5. I have a short attention span. [#35]
6. I forget instructions easily. [#46]
7. I have trouble remembering things, even for a few minutes (such as directions, phone numbers). [#56]
8. I have trouble doing more than one thing at a time. [#68]

Inhibit subscale*:

1. I tap my fingers or bounce my legs. [#5]
2. I have trouble sitting still. [#16]
3. I have problems waiting my turn. [#29]
4. I make inappropriate comments. [#36]
5. I make decisions that get me into trouble (legally, financially, socially). [#43]
6. People say that I am easily distracted. [#55]
7. I rush through things. [#58]
8. I am impulsive. [#73]

Shift subscale*:

1. I have trouble changing from activity or task to another. [#8]
2. I have trouble accepting different ways to solve problems with work, friends, or tasks. [#22]
3. I have trouble thinking of a different way to solve a problem when stuck. [#32]
4. I am bothered by having to deal with changes. [#44]
5. I get disturbed by unexpected changes in my daily routine. [#61]
6. After having a problem, I don't get over it easily. [#67]

*Items are followed by a [#] that corresponds with the item # from the original scale

APPENDIX E

SAMPLE STIMULUS FROM THE NIH FLANKER INHIBITORY CONTROL AND
ATTENTION TEST

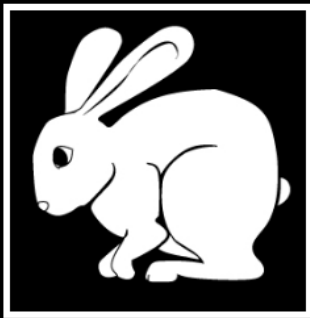
In this task, you will see a row of arrows. You should choose the button that matches the way the MIDDLE arrow is pointing.



APPENDIX F

SAMPLE STIMULUS FROM THE NIH DIMENSIONAL CHANGE CARD SORT TEST

We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.



APPENDIX G

SAMPLE STIMULUS FROM THE NIH LIST SORTING WORKING MEMORY TEST



PUMPKIN

NIH TB List Sorting Working Memory Age 7+

Say for the first item and then only as necessary: **Once you see the blank screen, tell me what you just saw in size order from smallest to biggest.** Click PLAY; mark the item *CORRECT* (Yes) or *INCORRECT* (No) based on participant's response.

Play

Pumpkin Strawberry Banana

Correct Order: Strawberry Banana Pumpkin

Correct?

☐ Yes ☐ No

< Go Back

Stop Test

Next >

APPENDIX H

SAMPLE STIMULUS FROM THE NIH PICTURE VOCABULARY TEST



Go Back

Play Again



REFERENCE LIST

- Acoach, C. L., & Webb, L. M. (2004). The influence of language brokering on Hispanic teenagers' acculturation, academic performance, and nonverbal decoding skills: A preliminary study. *Howard Journal of Communications, 15*(1), 1-19. doi: 10.1080/10646170490275459
- Adesope, O. O., Lavin, T., Thompson, T., & Ungerleider, C. (2010). A systematic review and meta-analysis of the cognitive correlates of bilingualism. *Review of Educational Research, 80*(2), 207-245.
- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage Publications, Inc.
- Ardasheva, Y., Tretter, T. R., & Kinny, M. (2012). English language learners and academic achievement: Revisiting the threshold hypothesis. *Language Learning, 62*, 769-812. doi:10.1111/j.1467-9922.2011.00652.x
- Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist, 55*(5), 469-480. doi:10.1037/0003-066X.55.5.469
- Arnett, J. J. (2007). Emerging adulthood: What is it, and what is it good for?. *Child Development Perspectives, 1*(2), 69-73. doi:10.1111/j.1750-8606.2007.00016.x
- Azur, M. J., Stuart, E. A., Frangakis, C., & Leaf, P. J. (2011). Multiple imputation by chained equations: what is it and how does it work?. *International journal of methods in psychiatric research, 20*(1), 40-49. doi:10.1002/mpr.329
- Baddeley, A. (2010). Working memory. *Current Biology, 20*(4), R136-R140.
- Baum, S. & Flores, S. M. (2011). Higher education and children in immigrant families. *The Future of Children, 21*(1), 171-193.
- Barac, R., & Bialystok, E. (2012). Bilingual effects on cognitive and linguistic development: Role of language, cultural background, and education. *Child Development, 83*, 413-422. doi: 10.1111/j.1467-8624.2011.01707.

- Baron, R. B., & Kenny, D. A. (1986). The moderator-mediator distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182. doi:10.1037//0022-3514.51.6.1173
- Barrett, A. N., Barile, J. P., Malm, E. K. & Weaver, S. R. (2012). English proficiency and peer interethnic relations as predictors of math achievement among Latino and Asian immigrant students. *Journal of Adolescence*, 35, 1619-1628. doi:10.1016/j.adolescence.2012.08.002
- Bell, M. A., Wolfe, C. D., & Adkins, D. R. (2007). Frontal lobe development during infancy and childhood. In D. J. Coch, K. W. Fischer, & G. Dawson (Eds.), *Human behavior learning, and the developing brain: Typical development* (pp. 247–276). New York: Guilford.
- Best, J. R., & Miller, P. H. (2010). A developmental perspective on executive function. *Child Development*, 81(6), 1641-1660. doi:10.1111/j.1467-8624.2010.01499.x
- Best, J. R., Miller, P. H. & Jones, L. L. (2009). Executive functions after age 5: Changes and correlates. *Developmental Review*, 29, 180-200. doi:10.1016/j.dr.2009.05.002
- Best, J. R., Miller, P. H. & Naglieri, J. A. (2011). Relations between executive function and academic achievement from ages 5 to 17 in a large, representative national sample. *Learning and Individual Differences*, 21, 327-336. doi:10.1016/j.lindif.2011.01.007
- Bialystok, E. (2006). Effect of bilingualism and computer video game experience on the Simon task. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie experimentale*, 60, 68-79. doi:10.1037/cjep2006008
- Bialystok, Ellen. (2009). Bilingualism: The good, the bad, and the indifferent. *Bilingualism: Language and Cognition*, 12, 3-11. doi:10.1017/S1366728908003477
- Bialystok, E., Craik, F. I. M. & Freedman, M. (2007). Bilingualism as a protection against the onset of symptoms of dementia. *Neuropsychologia*, 45, 459-464. doi:10.1016/j.neuropsychologia.2006.10.009
- Bialystok, E., Craik, F. I., Grady, C., Chau, W., Ishii, R., Gunji, A., & Pantev, C. (2005). Effect of bilingualism on cognitive control in the Simon task: Evidence from MEG. *NeuroImage*, 24(1), 40-49.

- Bialystok, E., Craik, F. I. M, Green, D. W., & Gollan, T. H. (2009). Bilingual minds. *Psychological Science in the Public Interest*, 10, 89-129. doi:10.1177/1529100610387084
- Bialystok, E., Craik, F. I. M, Klein, R. & Viswanathan, M. (2004). Bilingualism, Aging, and Cognitive Control: Evidence From the Simon Task. *Psychology and Aging*, 19, 290-303. doi:10.1037/0882-7974.19.2.290
- Bialystok, E., Craik, F., & Luk, G. (2008). Cognitive control and lexical access in younger and older bilinguals. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 34(4), 859. doi:10.1037/0278-7393.34.4.859
- Bialystok, E. & Feng, X. (2011). Language proficiency and its implications for monolingual and bilingual children. *Language and literacy development in bilingual settings*, 121-138.
- Bialystok, E. & Martin, M. M. (2004). Attention and inhibition in bilingual children: Evidence from the dimensional change card sort task. *Developmental Science*, 7, 325-339. doi:10.1111/j.1467-7687.2004.00351.x
- Bodrova, E., & Deborah J.. Leong. (2007). *Tools of the mind*. Upper Saddle River, NJ: Pearson.
- Bozick, R., Lauff, E., & Wirt, J. (2007). Education longitudinal study of 2002: A first look at the initial postsecondary experiences of high school sophomore class of 2002. *National Center for Education Statistics*.
- Bracken, B. A., & Keith, L. K. (2004). Professional manual for the Clinical assessment of Behavior. Lutz, FL : Psychological Assessment Resources.
- Bradley, R. H., & Corwyn, R. Bradley, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, 53, 371-399. doi:10.1146/annurev.psych.53.100901.135233
- Jacob, B. A. (2002). Where the boys aren't: Non-cognitive skills, returns to school and the gender gap in higher education. *Economics of Education review*, 21(6), 589-598.
- Broadbent, D. E., Cooper, P. F, FitzGerald, P. & Parkes, K. R. (1982). The Cognitive Failures Questionnaire (CFQ) and its correlates. *British Journal of Clinical Psychology*, 21, 1-16. doi:10.1111/j.2044-8260.1982.tb01421.x
- Bronfenbrenner, U. (2000). Ecological systems theory. In A. E. Kazdin (Ed.), *Encyclopedia of Psychology* (Vol. 3; pp. 129-133). Washington, DC, US: American Psychological Association; Oxford University Press.

- Bull, R., Espy, K. A. & Wiebe, S. A. (2008). Short-term memory, working memory, and executive functioning in preschoolers: Longitudinal predictors of mathematical achievement at age 7 years. *Developmental Neuropsychology*, 33, 205-228. doi:10.1080/87565640801982312
- Bumgarner, E., Martin, A., & Brooks-Gunn, J. (2013). Approaches to learning and Hispanic children's math scores: The moderating role of English proficiency. *Hispanic Journal of Behavioral Sciences*, 35(2), 241-259.
- Buriel, R., Perez, W., Terri, L., Chavez, D. V., & Moran, V. R. (1998). The relationship of language brokering to academic performance, biculturalism, and self-efficacy among Latino adolescents. *Hispanic Journal of Behavioral Sciences*, 20(3), 283-297. doi:10.1177/07399863980203001
- Cabrera, N. (2013). Positive development of minority children. *Social Policy Report*, 27(2), 1-22.
- Cain, G. (1975). Regression and selection models to improve nonexperimental comparisons. In C. Bennett and A. Lumsdaine (Eds.), *Evaluation and experiment* (pp. 297-317). New York: Academic Press, Inc.
- Carlson, S. M. (2005). Developmentally sensitive measures of executive function in preschool children. *Developmental Neuropsychology*, 28, 595-616. doi:10.1207/s15326942dn2802_3
- Carlson, S. M., & Meltzoff, A. N. (2008). Bilingual experience and executive functioning in young children. *Developmental Science*, 11, 282-298. doi: 10.1111/j.1467-7687.2008.00675.x
- Chall, J. (1983). *Stages of Reading Development*. New York: McGraw Hill. pp. 10-24.
- Chao, R. K. (2002). The role of children's linguistic brokering among immigrant Chinese and Mexican families. *Families of color: Developmental issues in contemporary sociohistorical contexts*.
- Chauncey, K., Grainger, J. & Holcomb, P. J. (2008). Code-switching effects in bilingual word recognition: A masked priming study with event-related potentials. *Brain and Language*, 105, 161-174. doi:10.1016/j.bandl.2007.11.006
- Christoffels, I. K., Firk, C., & Schiller, N. O. (2007). Bilingual language control: An event-related brain potential study. *Brain research*, 1147, 192-208.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

- Cohn, D., Passel, J., Wang, W., & Livingston, G. (2011). Barely half of US adults are married—a record low. *Pew Social and Demographic Trends*.
- Costa, A., Hernandez, M. & Sebastian-Galles, N. (2008). Bilingualism aids conflict resolution: Evidence from the ANT task. *Cognition*, 106, 59-86.
doi:10.1016/j.cognition.2006.12.013
- Cummins, J. (1979). Linguistic interdependence and the educational development of bilingual children. *Review of educational research*, 49(2), 222-251.
doi:10.2307/1169960
- Cummins, J. (2000). *Language, power, and pedagogy: Bilingual children in the crossfire* (Vol. 23). Multilingual Matters.
- Davidson, M. C., Amso, D., Anderson, L. C., Diamond A. (2006). Development of cognitive control and executive functions from 4 to 13 years: Evidence from manipulations of memory, inhibition, and task switching. *Neuropsychologia*, 44, 2037–2078. doi:10.1016/j.neuropsychologia.2006.02.006
- Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). Delis Kaplan Executive Function System: Examiner's manual. San Antonio, TX: Psychological Corporation.
- DeMars, C. (2010). *Item response theory*. New York, NY, US: Oxford University Press.
- Diamond, A., & Lee, K. (2011). Interventions shown to aid executive function development in children 4 to 12 years old. *Science*, 333(6045), 959-964.
- Dorner, L. M., Orellana, M. F., & Jimenez, R. (2008). “It’s one of those things you do to help the family”: Language brokering and the development of immigrant adolescents. *Journal of Adolescent Research*, 23(5), 515-543. doi: 10.1177/0743558408317563
- Dorner, L. M., Orellana, M. F., & Li-Grining, C. P. (2007). “I helped my mom,” and it helped me: Translating the skills of language brokers into improved standardized test scores. *American Journal of Education*, 113(3), 451-478. doi: 10.1086/512740
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: perseverance and passion for long-term goals. *Journal of personality and social psychology*, 92(6), 1087.
- Duncan, G. J., & Magnuson, K. A. (2005). Can family socioeconomic resources account for racial and ethnic test score gaps?. *The future of children*, 15(1), 35-54.

- Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child development*, 65(2), 296-318. doi:10.2307/1131385
- Durand, J., Telles, E., & Flashman, J. (2006). The demographic foundations of the Latino population. *Hispanics and the Future of America*, 66-99.
- Erikson, E. H. (1968). *Identity: Youth and crisis* (No. 7). WW Norton & Company.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods*, 39(2), 175-191.
- Fernandez, M., Tartar, J. L., Padron, D & Acosta, J. (2013). Neurophysiological marker of inhibition distinguishes language groups on a non-linguistic executive function test. *Brain and Cognition*, 83, 330-336. doi:10.1016/j.bandc.2013.09.010
- Flores, G. (2005). The impact of medical interpreter services on the quality of health care: a systematic review. *Medical Care Research and Review*, 62(3), 255-299.
- Folstein, J. R. & Van Petten, C. (2008). Influence of cognitive control and mismatch on the N2 component of the ERP: A review. *Psychophysiology*, 45, 152-170. doi:10.1111/j.1469-8986.2007.00602.x
- Fulgini, A. J., Tseng, V., & Lam, M. (1999). Attitudes toward family obligations among American adolescents with Asian, Latin American, and European backgrounds. *Child Development*, 70(4), 1030-1044. doi: 10.1111/1467-8624.00075
- Fry, R., & Gonzales, F. (2008). *One in five and growing fast: A profile of Hispanic public school students*. Washington, DC: Pew Hispanic Center.
- Fry, R. & Lopez, M. H. (2012). *Now largest minority group on four-year college campuses: Hispanic student enrollments reach new highs in 2011*. Washington, DC: Pew Hispanic Center.
- Fry, R., & Taylor, P. (2013). *High school drop-out rate at record low: Hispanic high school graduates pass whites in rate of college enrollment*. Washington, DC: Pew Hispanic Center.
- Gehring, W. J., Liu, Y., Orr, J. M., Carp, J. (2012). The error-related negativity (ERN/Ne). In S. J. Luck & E. S. Kappenman (Eds.), *The Oxford Handbook of Event-Related Potential Components* (pp. 231-294). New York, NY: Oxford University Press.

- Gershon, R. C., Cella, D., Fox, N. A., Havlik, R. J., Hendrie, H. C., Wagster, M. V. (2010). Assessment of neurological and behavioural function: The NIH Toolbox, *The Lancet Neurology*, 9 (2). 138-139. doi: 10.1016/51474-4422(09)70335-7
- Gioia, G. A., Isquith, P. K., & Kenealy, L. E. (2008) Assessment of behavioral aspects of executive function. In V. Anderson, R. Jacobs, and P.J. Anderson (Eds.), *Executive functions and the Frontal Lobes: A Lifespan Perspective* (pp. 179-202). New York, NY: Taylor & Francis Group, LLC.
- Guan, S. A, Greenfield, P. M. & Orellana, M. F. (2014). Translating into understanding: Language brokering and prosocial development in emerging adults from immigrant families. *Journal of Adolescent Research*, 29, 331-355. doi:10.1177/0743558413520223
- Guy, S. C., Isquith, P. K., & Gioia, G. A. (2004). *Behavior Rating Inventory of Executive Function—Self-Report version professional manual*. Lutz, FL: Psychological Assessment Resources.
- Hamilton, B. E., Martin, J. A., & Ventura, S. J. (2013). *Births: Preliminary data for 2012*. Hyattsville, MD: National Center for Health Statistics.
- Hardt, J., & Rutter, M. (2004). Validity of adult retrospective reports of adverse childhood experiences: review of the evidence. *Journal of Child Psychology and Psychiatry*, 45(2), 260-273.
- Hayes, A. F. (2015) Some frequently asked questions. Retrieved December 2014 from <http://www.afhayes.com/macrofaq.html>
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.
- Hayes, A. F. (2012). *PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling*. Manuscript submitted for publication.
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, 76(4), 408-420. doi:10.1080/03637750903310360
- Hayes, A. F., Preacher, K. J., & Myers, T. A. (2011). Mediation and the estimation of indirect effects in political communication research. In E. P. Bucy & R. L. Holbert (Eds.), *Sourcebook for political communication research: Methods, measures, and analytical techniques*. (p. 434-465). New York: Routledge.

- Heil, M., Osman, A., Wiegmann, J., Rolke, B. & Hennighausen, E. (2000). N200 in the Eriksen-task: Inhibitory executive process? *Journal of Psychophysiology*, 14, 218-225. doi:10.1027//0269-8803.14.4.218
- Herrnstein, R. J., & Murray, C. (2010). *Bell curve: Intelligence and class structure in American life*. Simon and Schuster.
- Hervais-Adelman, A. G., Moser-Mercer, B., & Golestani, N. (2011). Executive control of language in the bilingual brain: integrating the evidence from neuroimaging to neuropsychology. *Frontiers in Psychology*, 2, 1-8. doi: 10.3389/fpsyg.2011.00234
- Hughes, C. (1998). Executive function in preschoolers: Links with theory of mind and verbal ability. *British Journal of Developmental Psychology*, 16, 233–253. doi:10.1111/j.2044-835X.1998.tb00921.x
- Huizinga, M., Dolan, C. V., & Van der Molen, M. W. (2006). Age-related change in executive function: Developmental trends and a latent variable analysis. *Neuropsychologia*, 44, 2017–2036. doi:10.1016/j.neuropsychologia.2006.01.010
- Kaushanskaya, M. & Marian, V. (2007). Bilingual Language Processing and Interference in Bilinguals: Evidence From Eye Tracking and Picture Naming. *Language Learning*, 57, 119-163. doi:10.1111/j.1467-9922.2007.00401.x
- Kenny, D. A. (2008). Reflections on mediation. *Organizational Research Methods*, 11(2), 353-358. doi: 10.1177/1094428107308978
- Konnikova, M. (2015, January 22) Is bilingualism really an advantage? *The New Yorker*, retrieved from: <http://www.newyorker.com/science/maria-konnikova/bilingual-advantage-aging-brain>
- Kousaie, S., & Phillips, Natalie A. (2012). Conflict monitoring and resolution: Are two languages better than one? Evidence from reaction time and event-related brain potentials. *Brain Research*, 1446, 71-90. doi:10.1016/j.brainres.2012.01.052
- Kovács, Á. M., & Mehler, J. (2009). Cognitive gains in 7-month-old bilingual infants. *Proceedings of the National Academy of Sciences*, 106(16), 6556-6560. doi:10.1073/pnas.0811323106
- Kroll, J. F., Bobb, S. C., & Wodniecka, Z. (2006). Language selectivity is the exception, not the rule: Arguments against a fixed locus of language selection in bilingual speech. *Bilingualism: Language and Cognition*, 9(02), 119-135.
- Lee, V. E., & Burkam, D. T. (2002). *Inequality at the starting gate: Social background differences in achievement as children begin school*. Economic Policy Institute, 1660 L Street, NW, Suite 1200, Washington, DC 20036.

- Love, J.A., & Buriel, R. Language brokering, autonomy, parent-child bonding, biculturalism, and depression (2007). *Hispanic Journal of Behavioral Sciences*, 29(4), 472-491. doi: 10.1177/0739986307307229
- Lu, C.-H. & Proctor, R. W. (1995). The influence of irrelevant location information on performance: A review of the Simon and spatial Stroop effects. *Psychonomic Bulletin & Review*, 2, 174-207. doi:10.3758/BF03210959
- Luciana, M., & Nelson, C. A. (1998). The functional emergence of prefrontally-guided working memory systems in four- to eight-year-old children. *Neuropsychologia*, 36, 273-293. doi:10.1016/S0028-3932%2897%2900109-7
- Luck, S. J. (2005). *An Introduction to the Event-Related Potential Technique*. Cambridge, MA: Massachusetts Institute of Technology.
- Matsuda, P. K. (2006). The myth of linguistic homogeneity in US college composition. *College English*, 637-651.
- Magezi, D. A., Khateb, A., Mouthon, M., Spierer, L. & Annoni, J.-M. (2012). Cognitive control of language production in bilinguals involves a partly independent process within the domain-general cognitive control network: Evidence from task-switching and electrical brain activity. *Brain and Language*, 122, 55-63. doi:10.1016/j.bandl.2012.04.008
- Malakoff, M., & Hakuta, K. (1991). Translation skill and metalinguistic awareness in bilinguals. In E. Bialystok (Ed.), *Language processing in bilingual children* (pp. 141-166). Cambridge: Cambridge University Press.
- Mallinckrodt, B., Abraham, W., Wei, M., & Russell, D. (2006). Advances in testing the statistical significance of mediation effects. *Journal of Counseling Psychology*, 53, 372-378. doi:10.1037/0022-0167.53.3.372
- Marian, V., Blumenfeld, H. K. & Kaushanskaya, M. (2007). The language experience and proficiency questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals. *Journal of Speech, Language, and Hearing Research*, 50, 940-967. doi:10.1044/1092-4388%282007/067%29
- Martin-Rhee, M. M. & Bialystok, E. (2008). The development of two types of inhibitory control in monolingual and bilingual children. *Bilingualism: Language and Cognition*, 11, 81-93. doi:10.1017/S1366728907003227
- McClelland, M. M., Acock, A. C., Piccinin, A., Rhea, S. A. & Stallings, M. C. (2013). Relations between preschool attention span-persistence and age 25 educational outcomes. *Early Childhood Research Quarterly*, 28, 314-324. doi:10.1016/j.ecresq.2012.07.008

- McQuillan, J., & Tse, L. (1995). Child language brokering in linguistic minority communities: Effects on cultural interaction, cognition, and literacy. *Language and Education*, 9(3), 195-215.
- Mestre, J. P. (1981). Predicting academic achievement among bilingual Hispanic college technical students. *Educational and Psychological Measurement*, 41(4), 1255-1264.
- Michael, E. B., & Gollan, T. H. (2005). Being and Becoming Bilingual: Individual Differences and Consequences for Language Production. In J. F. Kroll & A. M. B. de Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches* (pp. 389-407). New York, NY, US: Oxford University Press.
- Miller, C. C., Cardinal, L. B., & Glick, W. H. (1997). Retrospective reports in organizational research: A reexamination of recent evidence. *Academy of Management Journal*, 40(1), 189-204.
- Minuchin, S. (1974). *Families and family therapy*. Harvard University Press.
- Miyake, A., & Friedman, N. (2012). The nature and organization of individual differences in executive functions: Four general conclusions. *Current Directions in Psychological Science*, 21, 8-14. doi: 10.1177/0963721411429458
- Morales, A., & Hanson, W. E. (2005). Language brokering: An integrative review of the literature. *Hispanic Journal of Behavioral Sciences*, 27(4), 471-503. doi:10.1177/0739986305281333
- Oller, D. K., & Eilers, R. E. (Eds.). (2002). *Language and literacy in bilingual children*. Clevedon: Multilingual Matters.
- Orellana, M. F. (2003). Responsibilities of children in Latino immigrant homes. *New Directions for Youth Development*, 2003(100), 25-39.
- Orellana, M. F. (2009). *Translating childhoods: Immigrant youth, language, and culture*. Rutgers University Press.
- Orellana, M. F., Martinez, D. C., Lee, C. H. & Montano, E. (2013). "Language as a tool in diverse forms of learning": Corrigendum. *Linguistics and Education*, 24, 272. doi:10.1016/j.linged.2013.01.002
- Orellana, M. F., Reynolds, J., Dorner, L., & Meza, M. (2003). In Other Words: Translating or "Para-Phrasing" as a Family Literacy Practice in Immigrant Households. *Reading Research Quarterly*, 38(1), 12-34. doi:10.1598/RRQ.38.1.2

- Perani, D., Abutalebi, J., Paulesu, E., Brambati, S., Scifo, P., Cappa, S. F., et al. (2003). The role of age of acquisition and language usage in early, high-proficient bilinguals: An fMRI study during verbal fluency. *Human Brain Mapping, 19*, 170-182. doi:10.1002/hbm.10110
- Perry, R. P., Hladkyj, S., Pekrun, R. H., & Pelletier, S. T. (2001). Academic control and action control in the achievement of college students: A longitudinal field study. *Journal of Educational Psychology, 93*, 776-789. doi:10.1037/0022-0663.93.4.776
- Pew Hispanic Center. (2009). Between two worlds: How young Latinos come of age in America. Retrieved December 2013 from <http://www.pewhispanic.org/files/reports/117.pdf>
- Polich, J. (2007). Updating P300: an integrative theory of P3a and P3b. *Clinical Neurophysiology, 118*(10), 2128-2148. doi:10.1016/j.clinph.2007.04.019
- Polich, J. (2012). Neuropsychology of P300. In S. J. Luck & E. S. Kappenman (Eds.), *The Oxford Handbook of Event-Related Potential Components* (pp. 159-188). New York: NY. Oxford University Press.
- Portocarrero, J. S., Burright, R. G., & Donovan, P. J. (2007). Vocabulary and verbal fluency of bilingual and monolingual college students. *Archives of Clinical Neuropsychology, 22*(3), 415-422. doi:10.1016/j.acn.2007.01.015
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers, 36*(4), 717-731. doi:10.3758/BF03206553
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879-891. doi:10.3758/BRM.40.3.879
- Rainey, V. R., Davidson, D., & Li-Grining, C. P. (under review). Executive functions as predictors of syntactic awareness in monolingual (English) and bilingual (English-Spanish) language brokers and non-brokers. *Applied Psycholinguistics*.
- Rainey, V. R., Flores, V., Morrison, R. G., David, E. J. R., & Sifton, R. L. (2014). Mental health risk associated with childhood language brokering. *Journal of Multilingual and Multicultural Development, 1*-16. doi: 10.1080/01434632.2013.870180
- Reynolds, J. F., Dorner, L. M. & Orellana, M. F. (2011). Siblings as cultural educators and socializing agents. Caspi, Jonathan [Ed]. *Sibling development: Implications for mental health practitioners*. New York, NY, US: Springer Publishing Co, US; pp. 107-121.

- Reynolds, J. F. & Orellana, M. F. (2009). New immigrant youth interpreting in White public space. *American Anthropologist*, 111, 211-223. doi:10.1111/j.1548-1433.2009.01114.
- Roberts, Patricia M, Garcia, Linda J, Desrochers, Alain & Hernandez, Denise. (2002). English performance of proficient bilingual adults on the Boston Naming Test. *Aphasiology*, 16, 635-645. doi:10.1080/02687030244000220
- Rubia, K., Smith, A. B., Woolley, J., Nosarti, C., Heyman, I., Taylor, E., et al. (2006). Progressive increase of frontostriatal brain activation from childhood to adulthood during event-related tasks of cognitive control. *Human Brain Mapping*, 27, 973–993. doi:10.1002/hbm.20237
- Ruban, L. M., & McCoach, D. B. (2005). Gender differences in explaining grades using structural equation modeling. *The Review of Higher Education*, 28(4), 475-502. doi:10.1353/rhe.2005.0049
- Saunders, W. M., & Marcelletti, D. J. (2013). The gap that can't go away: The catch-22 of reclassification in monitoring the progress of English Learners. *Educational Evaluation and Policy Analysis*, 35, 139-156. doi:10.3102/0162373712461849
- Shen & Guan (2015). Aspects of language brokering and academic performance among college students. Poster presented at the 2015 Biennial Meeting of the Society for Research in Child Development, Philadelphia, PA.
- Silton, R. L., Heller, W., Towers, D. N., Engels, A. S., Spielberg, J. M., Edgar, J. C., et al. (2010). The time course of activity in dorsolateral prefrontal cortex and anterior cingulate cortex during top-down attentional control. *Neuroimage*, 50(3), 1292-1302. doi:10.1016/j.neuroimage.2009.12.061
- Sinharay, S., Stern, H. S., & Russell, D. (2001). The use of multiple imputation for the analysis of missing data. *Psychological methods*, 6(4), 317.
- Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of educational research*, 75(3), 417-453.
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological methodology* (pp. 290-312). Washington, DC: American Sociological Association.
- Sobel, M.E. (1986) Some new results on indirect effects and their standard errors in covariance structure models. *Sociological Methodology*, 16, 159-186. doi:10.2307/270922

- Stone, C. A., & Sobel, M. E. (1990). The robustness of estimates of total indirect effects in covariance structure models estimated by maximum likelihood. *Psychometrika*, 55(2), 337–352. doi: 10.1007/BF02295291
- St. Clair-Thompson, H. L. & Gathercole, S. E. (2006). Executive functions and achievements in school: Shifting, updating, inhibition, and working memory. *The Quarterly Journal of Experimental Psychology*, 59, 745-759. doi:10.1080/17470210500162854
- Suárez-Orozco, C., & Suárez-Orozco, M. M. (2009). *Children of immigration*. Harvard University Press.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Allyn and Bacon.
- Taylor, P., Kochhar, R., Morin, R., Wang, W., Dockterman, D., & Medina, J. (2009). America's changing workforce: Recession turns a graying office grayer. In R. Morin (Ed.), *Pew Social Trends*, 3.
- Tse, L. (1995a). Language brokering among Latino adolescents: Prevalence, attitudes, and school performance. *Hispanic Journal of Behavioral Sciences*, 17(2), 180-193. doi:10.1177/07399863950172003
- Tse, L. (1995b). When Students Translate for Parents: Effects of Language Brokering. *Cabe Newsletter*, 17(4), 16-17.
- Tseng, V. (2004). Family interdependence and academic adjustment in college: Youth from immigrant and U.S.-born families. *Child Development*, 75(3), 966-983. doi: 10.1111/j.1467-8624.2004.00717.x
- Umaña-Taylor, A. J. (2003). Language brokering as a stressor for immigrant children and their families. In M. Coleman & L. Ganong (Eds.), *Points and counterpoints: Controversial relationship and family issues in the 21st century: An anthology* (pp. 157-159). Los Angeles, CA: Roxbury.
- U.S. Bureau of Labor Statistics. (2010). Overview of race and Hispanic origin: 2010. Retrieved May 8, 2011 from <http://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf>
- U.S. Census Bureau. (2011). *Poverty Rate by Race/Ethnicity, States (2008-2009), U.S. (2009)*. Retrieved from the Henry J. Kaiser Family Foundation:
- U.S. Department of Education, National Center for Education Statistics. (2013). *The Condition of Education 2013* (NCES 2013-037), Status Dropout Rates. Retrieved December 1, 2013.

- Valdés, G. (2003). Expanding definitions of giftedness: Young interpreters of immigrant background. Mah-wah, NJ: Erlbaum.
- Vygotsky, L. (1978). Interaction between learning and development. *Readings on the development of children*, 34-41.
- Weissberger, G. H., Gollan, T. H., Bondi, M. W., Clark, L. R., & Wierenga, C. E. (2015). Language and task switching in the bilingual brain: Bilinguals are staying, not switching, experts. *Neuropsychologia*, 66, 193-203.
- Weisskirch, R. S., Kim, S. Y., Zamboanga, B. L., Schwartz, S. J., Bersamin, M., & Umaña-Taylor, A. J. (2011). Cultural influences for college student language brokers. *Cultural Diversity and Ethnic Minority Psychology*, 17(1), 43.
- Williams, J., & MacKinnon, D. P. (2008). Resampling and distribution of the product method for testing indirect effects in complex models. *Structural Equation Modeling*, 15(1), 23-51. doi:10.1080/10705510701758166
- Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock-Johnson tests of achievement*. Itasca, IL: Riverside Publishing.
- Zeegers, P. (2004). Student learning in higher education: A path analysis of academic achievement in science. *Higher Education Research & Development* 23(1), 35-56. doi:10.1080/0729436032000168487
- Zelazo, P. D., Anderson, J. E., Richler, J., Wallner-Allen, K., Beaumont, J. L. & Weintraub, S. (2013). National Institutes of Health Toolbox Cognition Battery (NIH Toolbox CB): Validation for children between 3 and 15 years: II. NIH Toolbox Cognition Battery (CB): Measuring executive function and attention. *Monographs of the Society for Research in Child Development*, 78, 16-33. doi:10.1111/mono.12032
- Zelazo, P. D. & Carlson, S. M. (2012). Hot and cool executive function in childhood and adolescence: Development and plasticity. *Child Development Perspectives*, 6(4), 354-360.
- Zelazo, P. D., Frye, D. & Rapus, T. (1996). An age-related dissociation between knowing rules and using them. *Cognitive Development*, 11, 37-63. doi:10.1016/S0885-2014(96)00027-1
- Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2), 197-206. doi:10.1086/651257

VITA

In 2006, Dr. Flores graduated magna cum laude from Loyola University Chicago, majoring in Psychology and minoring in both Spanish and Theology. During Dr. Flores' undergraduate studies at Loyola, she wrote an Honors Thesis on Bilingual Preschoolers' Metalinguistic Awareness under the guidance of Associate Professor Denise Davidson, Ph.D. This fueled Dr. Flores' interest in teaching and researching English Language Learners (ELLs).

After graduation, Dr. Flores taught 2nd grade for two years in an urban area in south Phoenix through Teach For America (TFA). Once Dr. Flores completed her commitment to TFA, she pursued graduate school in Developmental Psychology in order to research questions that arose in her teaching experience with lower-income, bilingual students. At Loyola, Dr. Flores worked as a teaching and research assistant for Dr. Christine Li-Grining, Dr. Bob Morrison, and Dr. Perla Gámez. Upon completion of her doctorate, Dr. Flores will pursue either a faculty position in academia or a post-doctoral position to gain further research experience.