Fast Mapping by Bilingual Preschool Children in a Narrative Context

Danielle Kemp

University of Colorado at Boulder, danielle.kemp@colorado.edu

Follow this and additional works at: https://scholar.colorado.edu/slhs_gradetds

Part of the Bilingual, Multilingual, and Multicultural Education Commons, and the First and Second Language Acquisition Commons

Recommended Citation


https://scholar.colorado.edu/slhs_gradetds/12

This Thesis is brought to you for free and open access by Speech, Language and Hearing Sciences at CU Scholar. It has been accepted for inclusion in Speech, Language, and Hearing Sciences Graduate Theses & Dissertations by an authorized administrator of CU Scholar. For more information, please contact cuscholaradmin@colorado.edu.
FAST MAPPING BY BILINGUAL PRESCHOOL CHILDREN
IN A NARRATIVE CONTEXT

By

DANIELLE KEMP

B.A., University of Colorado at Boulder, 2010

A thesis submitted to the

Faculty of the Graduate School of the

University of Colorado at Boulder in partial fulfillment

of the requirement for the degree of

Master of Arts

Department of Speech, Language, and Hearing Sciences

2012
This thesis entitled:
Fast Mapping by Bilingual Preschool Children in a Narrative Context
written by Danielle Kemp
has been approved by the Department of Speech, Language, and Hearing Sciences

__________________________
Pui Fong Kan, Ph.D.

__________________________
Brenda Schick, Ph.D.

__________________________
Eliana Colunga, Ph.D.

Date ______________

The final copy of this thesis has been examined by the signatories, and we find that both the content and the form meet acceptable presentation standards of scholarly work in the above mentioned discipline.

IRB protocol # 11-007
Abstract

The purpose of this study is to explore fast mapping skills in sequential bilingual children who speak Spanish (L1) as a home language from birth and started to learn English (L2) as a second language in a preschool setting. Eighteen typically-developing preschool sequential bilingual children completed a fast mapping task in a narrative context comparing their performance in L1 and L2 and in two presentation modalities (cartoon and storybook). Results indicated that the fast mapping task in a narrative context supports unfamiliar word learning. In addition, children are capable of learning unfamiliar words through a cartoon stimulus equally as well as storybook reading. The clearest learning trajectories are seen in L1. There is a clear cross-linguistic relationship in fast mapping performance in both the storybook and cartoon modality. This demonstrates support of the language specificity of word learning and that L1 support is critical during language development even during varied English acquisition stages. The cross-linguistic relationship also indicates the interaction of languages and the continuity of knowledge between L1 and L2 within a bilingual child. Cartoon media when enhanced with adult-child interaction can support word-learning and offers a promising medium to encourage adult-child interactions.
Acknowledgements

Special thanks to all who made this project possible. First and foremost my primary advisor, Dr. Pui Fong Kan, for her patient guidance and expertise in all stages of this thesis. Thank you for your mentorship and encouragement over the years. Also my committee members, Dr. Brenda Schick and Dr. Eliana Colunga, for their guidance and knowledge. To Dr. Susan Moore, for her behind-the-scenes work in getting me connected to Boulder County Head Start. To the staff at Boulder County Head Start including Maria Harper, all classroom teachers, and teaching assistants. And most especially, Olivia Coyne, who observed testing everyday, gave me excellent advice and encouragement, and stood up for this project when no one else would!

To all the research assistants who volunteered their time with this project: Lindsey Miller, Grace Kloberdanz, Michel Swanson, Mary Ervin, Sheryl Schaller, and Hillary Heintz. Thanks to the parents for their time and consideration. And finally to all the wonderful children who participated at Head Start, who always greeted me with warm smiles and made this project so rewarding! This project would have been impossible without everyone’s generosity and collaboration.
# Table of Contents

Introduction .................................................................................................................. 1
  Fast Mapping ........................................................................................................... 3
  Storybook Reading and Vocabulary Development ................................................. 6
  Television Use and Vocabulary Development ......................................................... 9
  Fast Mapping in Two Narrative Contexts: Storybook Reading and Cartoon
    Presentation Modalities ......................................................................................... 14
  Research Questions and Predictions ...................................................................... 16

Methods ...................................................................................................................... 17
  Participants ............................................................................................................. 17
    Pre-existing vocabulary knowledge .................................................................... 18
    Parent questionnaire ............................................................................................. 19
      Language use ...................................................................................................... 19
      Storybook use in the home ................................................................................. 19
      Television use in the home ............................................................................... 20
  Stimuli Development ............................................................................................. 20
    Cartoon and storybook ....................................................................................... 20
    Fast mapping targets ......................................................................................... 21
    Script .................................................................................................................... 21
  Measures ................................................................................................................ 22
    Pre and post-stimulus test fast mapping targets ............................................... 22
  Procedures ............................................................................................................. 23

Results ....................................................................................................................... 25
  Question One ......................................................................................................... 25
  Question Two ........................................................................................................ 26
  Question Three ..................................................................................................... 26
  Additional Analyses ............................................................................................... 27
  Summary of Results ............................................................................................... 27

Discussion ................................................................................................................ 28

Limitations and Future Studies .................................................................................. 32

References ............................................................................................................... 34

Appendices ............................................................................................................... 57
  Appendix A: Table A: Hayes & Ahrens (1988) ...................................................... 57
  Appendix B: Parent Questionnaire ................................................................. 58
  Appendix C: Table C: Patterson (2002) .............................................................. 59
  Appendix D: Figure D: Sample Storybook Page ............................................. 60
  Appendix E: Figure E: Sample Testing Sheet ................................................... 61
  Appendix F: Table F: Fast Mapping Targets testing sheets including foils .......... 62
  Appendix G: Figure F1: Procedure ................................................................. 63
Tables

Table 1: *Participant Information* ................................................................. 41
Table 2: *ROWPVT Raw Scores in English and Spanish* .............................. 43
Table 3: *Fast Mapping Targets: English* .................................................. 47
Table 4: *Fast Mapping Targets: Spanish* .................................................. 48
Figures

Figure 1: Cross-linguistic Relationship Pre-existing Vocabulary Knowledge ..................42
Figure 2: Dominant Language ..........................................................................................44
Figure 3: Language Used at School .................................................................................45
Figure 4: Language Used at Home ...............................................................................46
Figure 5: Correlation ROWPVT and Pre-stimulus English ........................................49
Figure 6: Correlation ROWPVT and Pre-stimulus Spanish ........................................50
Figure 7: Fast Mapping Gains Cartoon English ..............................................................51
Figure 8: Fast Mapping Gains Cartoon Spanish ..............................................................52
Figure 9: Fast Mapping Gains Storybook English ..........................................................53
Figure 10: Fast Mapping Gains Storybook Spanish .......................................................54
Figure 11: Cross-linguistic Relationship Cartoon .........................................................55
Figure 12: Cross-linguistic Relationship Storybook .......................................................56
Fast Mapping by Bilingual Preschool Children in a Narrative Context

**Introduction**

The purpose of this study is to explore fast mapping skills in bilingual children who speak Spanish (L1) as a home language from birth and started to learn English (L2) as a second language in a preschool setting. Fast mapping is a critical initial stage of word learning. It involves learning and mapping lexical and semantic representations of new words after one to two exposures to the word (e.g., Kan & Kohnert, 2008). In particular, this study examines fast mapping skills in a narrative context in two common presentation modalities: storybooks and cartoons. Additionally, the bilingual child’s ability to form the initial form-referent mappings of the new words via this narrative context was compared in their two languages, Spanish and English.

Young children, monolingual or bilingual, learn new words at a rapid rate from a variety of enriching experiences. A young monolingual child learns on average nine to ten words per day through various incidental learning experiences (Nagy & Herman, 1987). Incidental learning experiences, where children fast map or learn a new word after a brief exposure to that word, include dinner time conversation, watching television, and reading books (Justice, Mayer, & Walpole, 2005; Nagy & Herman, 1987). Bilingual children’s pattern of vocabulary development is similar to monolinguals when comparing a sum of their skills in both languages (Pearson & Fernández, 1994; Pearson, Fernández, & Oller, 1993; Umbel, Pearson, Fernández & Oller, 1992). Bilinguals also learn from similar experiences including storybook reading (Patterson, 2002). However, the effect of television on word learning is unclear in bilinguals especially when comparing their two languages thus requiring further investigation (Patterson, 2002; Uchikoshi, 2006). Vocabulary learning by both monolinguals and bilinguals is influenced by not only
environmental experiences, but by underlying language processing ability (Castilla, Restrepo, & Perez-Leroux, 2009; Conboy & Thal, 2006). Further bilingual children also exhibit a language factor, as vocabulary learning and skill can differ in L1 and L2 (Castilla et al., 2009; Conboy & Thal, 2006; Marchman, Martínez-Sussmann, & Dale, 2004; Pearson, Fernández, Lewedeg, & Oller, 1997). Fast mapping, the child’s ability to incidentally learn new words, can reveal how vocabulary development in a bilingual child’s two languages interact and whether external or internal factors dominate. External factors include quality and quantity of environmental input, differences in modalities such as cartoons and storybooks, and interactional styles of parents (Jia, Aaronson, & Wu, 2002; Patterson, 2002; Rice & Woodsmall, 1988; Robbins & Ehri, 1994). Internal factors include underlying language processing abilities, accumulated linguistic knowledge, and language proficiency (Castilla et al., 2009; Conboy & Thal, 2006; Jia et al., 2002; Pearson et al., 1997). In summary, studying a bilingual child’s language development allows researchers to examine external environmental factors and internal language processing ability affecting this development (Pearson et al., 1997). Furthermore, understanding these factors in relation to fast mapping ability embedded in narrative contexts with bilingual children is an important motivation behind this study.

The literature review below explores fast mapping studies with bilinguals including theoretical underpinnings. A gap in the literature is revealed in that many fast mapping studies have used an artificial training session paradigm and not explored the use of narratives with bilingual children. Next, two common presentation modalities involving narratives, storybook reading and television viewing, are related to vocabulary development in children, both monolingual and bilingual. Finally, fast mapping studies in narrative contexts related to the two presentation modalities are discussed.
Fast Mapping

Fast mapping studies offer a unique perspective on vocabulary development. Word learning is a gradual process including fast mapping (i.e. incomplete understanding from brief exposures), to mature accurate representations of words called slow mapping (Capone & McGregor, 2005; Justice et al., 2005). Vocabulary development is an accumulation of fast mapping experiences. Additionally, vocabulary size is determined by vocabulary learning or fast mapping (Gupta & Tisdale, 2009). Vocabulary development, however, is influenced by a combination of factors such as adult input, environment, socioeconomic status, language background, proportion of exposure and use in each language, and overall learning experiences (Hart & Risely, 2003; Leseman, 2000; Patterson, 2002; Umbel et al., 1992). Because of the fluid nature of L1 and L2 vocabulary development, traditional vocabulary measures (e.g. Peabody Picture Vocabulary Test (PPVT)) that focus on vocabulary knowledge, fail to capture a bilingual child’s vocabulary development in L2 and L2 (Umbel et al., 1992). In contrast, fast mapping performance reflects a child’s ability to grasp the meaning of a newly acquired words and can tell us a great deal about their language learning abilities. Furthermore, fast mapping can reveal language development and interaction within a bilingual child (Kan & Kohnert, 2008). Thus, fast mapping tasks that measure children’s learning ability has been considered as a potential clinical screening tool (e.g., Ellis Weismer & Evans, 2002).

Kan and Kohnert (2008), used a traditional fast mapping procedure, including an exposure and probe phase with nonwords, to explore the language learning construct in bilingual Hmong-English preschoolers. After receptive comprehension was tested in both languages, a differential relationship was noted between age and vocabulary knowledge in the two languages in addition to a negative cross-linguistic relationship indicating that temporary cross-linguistic
interference occurs during cognitively demanding processes such as fast mapping (Kan & Kohnert, 2008). They further predicted that this cross linguistic relationship could increase, change direction, or disappear as the child matures cognitively. Clearly, languages do not develop autonomously within a bilingual but rather interact as revealed by fast mapping studies. Additionally, children’s language proficiency affects their fast mapping performance (Kan & Kohnert, 2005, 2008).

Understanding the theoretical underpinnings of fast mapping studies is critical when working with the bilingual population. Many studies have explored the theoretical foundations of word learning within bilingual children, both simultaneous and sequential bilinguals (Castilla et al., 2009; Conboy & Thal, 2006; Marchman et al., 2004; Pearson et al., 1997; Simon-Cereijido & Gutiérrez-Clellen, 2009). Some studies have confirmed a non-interactional state of language development while others have demonstrated strong interactional evidence between languages. In a study of 113 simultaneous Spanish-English bilingual toddlers, the effects of environment, child’s achieved level of language, and word learning abilities were explored (Marchman et al., 2004). Within language relationships were stronger, with English clearly supporting English acquisition and Spanish supporting Spanish (Marchman et al., 2004). Learning was “highly language specific” not general, supporting a theory that acquisition in each language is relatively independent. Further, Simon-Cereijido and Gutiérrez-Clellen (2009) used spontaneous language samples, including measures of lexical diversity and grammatical complexity, and found no interaction between languages. However, other studies reveal interaction between languages. Conboy and Thal (2006) explored the theory that bilingual children can “pool linguistic concepts across languages” thus demonstrating an interactional language learning construct. The study of 64 simultaneous bilinguals concluded a possible cross-linguistic bootstrapping effect were
children “learn how to learn”, thus supporting their acquisition of different lexical structures across languages (Conboy & Thal, 2006). Further, developmental interdependence was revealed in a study of 49 sequential bilinguals attending English-instruction preschool (Castilla et al., 2009). Children completed various language measures including semantic measures of associations, similarities, differences, characteristic properties, categorization, function and linguistic concepts in the context of three short stories (Castilla et al., 2009). Results indicated that L1 skills can robustly predict later development in L2 and that “linguistic interdependence” is based on underlying language processing ability (Castilla et al., 2009). Not only did this study use a narrative context to test word learning ability, they also discovered that these measures can differentiate word learning ability in two languages and the theoretical construct that explains it.

In relation to the effect of input, Patterson (2002) concluded that English input was significantly and positively correlated with English reading in a group of simultaneous bilingual toddlers. This correlation was also true in Spanish, indicating that storybook reading supports vocabulary development in both languages for a simultaneous bilingual child and is supported by adult language input (Patterson, 2002). For bilingual Turkish-Dutch speaking children, the frequency of high level language interactions at home resulted in more instances of positive language transfer of receptive vocabulary skills (Leseman, 2000). Overall, exploring word learning in bilinguals can help differentiate various factors effecting word learning and the theoretical constructs either supporting within language models or interactional models.

Many traditional fast mapping studies include a formulated experimental design involving naming objects in a training session paradigm (Crais, 1987; Swingley, 2010). Some researchers suggest that fast mapping is a process of word learning that would be better explored in more naturalistic contexts (Braisby, Dockrell, & Best, 2001; Swingley, 2010). It is common
knowledge that children naturally enjoy engaging stories or narratives. Crais (1987) explored fast mapping performance on a set of 16 novel words with 20 elementary-aged students embedded in an oral story context. Findings suggested that using a story context is a natural and useful paradigm for exploring fast mapping skills (Crais, 1987). Further the author suggested exploration fast mapping performance with various story types, lengths, modes of presentation, or story structures. Two familiar narrative contexts or forms of presentation today include storybook reading and television viewing. What is the relationship between vocabulary development in both monolingual and bilingual children and these two presentation modalities?

**Storybook Reading and Vocabulary Development**

Storybook reading is a salient activity where children learn new words both in educational settings and in the home. Adult elaboration during the storybook interaction results in greater vocabulary gains occur for monolingual and bilingual children (Ard & Beverly, 2009; Cohen, Kramer-Vida, & Frye, 2010; Collins, 2010; Jiménez, Filippini, & Gerber, 2006; Justice, 2002; Justice et al., 2005; Leseman, 2000; McLeod & McDade, 2011; Patterson, 2002; Tsybina & Eriks-Brophy, 2010; Ulanoff & Pucci, 1999; Walsh, Kensinger Rose, Sanchez, & Burnham, 2012). Storybook reading is a familiar and supportive narrative context for word learning.

Justice (2002) explored the use of adult questioning and labeling with a group of monolingual English-speaking preschool children during storybook reading experiences. Novel word learning was greatest receptively and revealed that adult labeling produced better skills (Justice, 2002). Next, Justice et al. (2005), compared the use of incidental word learning to word learning facilitated by adult elaboration. A group of 57 low SES monolingual English speaking kindergartners, participated in a multi week, multi book study testing their incidental (control group) and supported (elaboration experimental group) word learning (Justice et al., 2005).
Incidental exposure of the 30 tested words indicated that four repeated readings over a period of ten weeks resulted in non significant word learning through expressive comprehension testing (Justice et al., 2005). Basically, children could not explain the meanings of the new words. The expressive comprehension testing was likely too challenging for this age group as previous studies indicate that receptive comprehension is greater (Justice et al., 2005). Adult elaboration or commenting including definitions and the use of the word in a supportive context resulted in greater word learning (Justice et al., 2005). Again in Ard & Beverly (2009) children benefitted most from adult commenting and questioning rather than no interaction. Clearly, adult elaboration supports novel word learning through the use of storybooks (Ard & Beverly, 2009; Justice, 2002; Justice et al., 2005; Leseman, 2000; Patterson, 2002).

Vocabulary learning studies through storybook reading also reveal the influence of children’s previous vocabulary base. In a study of 51 monolingual English-speaking middle to low SES kindergartners, when no adult commenting was included in the storybook reading interaction, children with larger vocabularies learned more words while children with low vocabularies fell further behind, similar to the famous Matthew effect (Robbins & Ehri, 1994; Stanovich, 1986). Monolingual children with low vocabulary skills pre-intervention made the most gains but required repeated concentrated exposures and supportive adult elaboration and interactions (Justice et al., 2005). Enriching learning experiences require adult interaction, elaboration and commenting to support word learning in children with a variety of language backgrounds.

Various studies have shown that adult interaction and elaboration with bilingual children can support vocabulary development (Cohen et al., 2010; Collins, 2010; Jiménez et al., 2006; Tsybina & Eriks-Brophy, 2010; Ulanoff & Pucci, 1999; Walsh et al., 2012). In a study of 80
Portuguese-English preschoolers, storybook reading incorporating rich explanations of vocabulary, resulted in “sophisticated” word learning in L2 (Collins, 2010). All interactions were conducted in English, the child’s L2, and results indicated that previous L2 vocabulary was a significant factor in their word learning ability (Collins, 2010). Again supporting the “rich get richer” framework. Additional studies incorporate shared storybook reading strategies in the child’s L1 (Cohen et al., 2010; Jiménez et al., 2006; Tsybina & Eriks-Brophy, 2010; Ulanoff & Pucci, 1999; Walsh et al., 2012). Using L1 preview-review strategies during storybook reading resulted in greater L2 vocabulary gains in a group of third grade bilinguals (Ulanoff & Pucci, 1999). Teaching parents and preschool teachers dialogic and shared storybook reading strategies and implementing such strategies in L1, resulted in L1 vocabulary gains (Cohen et al., 2010; Jiménez et al., 2006). In another program implementing dialogic reading intervention in L1 and L2 with typically developing bilinguals and vocabulary delayed bilingual preschoolers, results indicated substantial gains in functional vocabulary words (Tsybina & Eriks-Brophy, 2010). Furthermore, Walsh et al. (2012) explored the use of vocabulary noneliciting questioning and labeling in both Spanish and English. Results indicated that in a group of 44 bilingual preschoolers, noneliciting questions in Spanish promoted expressive novel word learning. Although noneliciting questions provided significant learning gains, individual children may respond differently to noneliciting labeling in L1 (Walsh et al., 2012). Clearly if parent-child interaction is present during storybook reading whether in L1 or L2, vocabulary learning is likely to occur. However, there appears to be a gap in the literature regarding bilingual children’s word learning abilities comparing storybook and cartoon presentation modalities.
Television Use and Vocabulary Development

Children are exposed daily to visual media including television and the internet on a variety of devices. A sample of children watched on average 7.5 hours of television per week till the age of five, where after age seven, television viewing declined to 5 hours per week (Wright et al., 2001). The American Academy of Pediatrics reports that children watch about 3 hours of television per day from a recent Nielsen Media report (AAP, 2001). School-age children, preschoolers, toddlers and even now infants are exposed to television programming both for educational and entertainment purposes in both home and school settings. How does television use affect vocabulary development in these children?

Many studies have revealed harmful side effects of television viewing (Chochaiya & Pruksananonda, 2008; Huston, Wright, Marquis, & Green, 1999; Pempek, Demers, Hanson, Kirkorian et al., 2009; Wright et al., 2001). In a large sample of mid-western American families of low to moderate socioeconomic status, Wright et al. (2001) found that toddlers who viewed cartoons frequently demonstrated lower vocabulary scores and poor early phonological awareness skills later as preschoolers compared to infrequent television viewers. Further, these negative effects can be long lasting (Wright et al., 2001). General programming, excluding educational programming designed to support school readiness, resulted in more negative effects including displacement from social interaction and language use (Wright et al., 2001). Television displaces more cognitively challenging activities such as play, social interaction, reading, and physical activity; all critical activities in language development (Huston et al., 1999). In a longitudinal study of television use in two cohorts of toddlers and preschoolers, reading and educational activities varied inversely with viewing cartoons and general audience programming (Huston et al., 1999). Time learning academic content is displaced by television use in this
cohort. Further, reading and educational activities were displaced by general audience programming in younger children (Huston et al., 1999). Not only are children being displaced from more enriching activities but the choices of their parents affect them further.

Many external factors affect television viewing time and explain the prevalence of television today. Maternal education and home environment quality predicted the types of programming children viewed; relatively highly educated mothers with positive home environments resulted in frequent viewing of educational television programs and infrequent viewing of entertainment television (Huston et al., 1999). As mentioned above both general audience programming and child-directed programming can be harmful to children’s language development (Huston et al., 1999, Wright et al., 2001). This parental influence is higher in preschool aged children (Huston et al., 1999). Parental education, occupational status, family structure, child care experience, birth order, parent regulation of television use, encouragement of television use, and the child’s initial language ability are all factors attributed to lower language development (Wright et al., 2001). In addition, Spanish-speaking parents watched high amounts of educational programming, to develop English language skills (Wright et al., 2001). Families with more “risk” factors, low socio-economic status, education, and language differences, generally expose their children to more television.

Television viewing also reduces the quality and quantity of parent-child interactions (Chochaiya & Pruksananonda, 2008; Kirkorian et al., 2009; Pempek et al., 2007). In language delayed toddlers from Thailand, more beneficial activities such as social interaction and play were replaced with television viewing (Chochaiya & Pruksananonda, 2008). Many of the language delayed children watched television alone, spending almost 3.05 hours per day watching television from an early age of 12 months, resulting in reduced interaction with their
parents and caregivers. Chochaïya and Pruksananonda (2008) concluded that television use is an
critical environmental trigger in language delayed children and that development is built on rich
conversational interactions between the caregiver and child. Many infant-directed videos offer a
model of parent-child interaction (Pempek et al., 2007) promising higher instances of mediation
and interaction. However during a lab observation of 152 middle class mostly Caucasian parent-
infant dyads, interactions while the infant-directed programming was on, resulted in decreased
quality and quantity of mediation including talking about what is seen on the screen (Pempek et
al., 2007). Further, Kirkorian et al. (2009) demonstrated that parents were less verbally
interactive with their children when the television was on. They were also less responsive to their
child’s bids for attention. Reduced responsiveness of the parent resulted in more passive
interactions during adult-directed television viewing (Kirkorian et al., 2009). Television viewing,
especially when adult-directed, results in solitary television viewing by children, reduced social
and language interaction, and overall reduced verbal responsiveness from parents.

Although, television viewing is found to be detrimental in various ways, families
continue to watch television as a means for relaxation, entertainment, and learning (Lemish &
Rice, 1986). The American Academy of Pediatrics makes several suggestions to families
including: reducing viewing time to one to two hours per day, removing television sets from
bedrooms, discouraging television viewing in children under two years old, monitoring
programming to ensure educational and nonviolent programs, viewing programs along with
children and discussing the content, and encouraging other forms of entertainment including
reading, hobbies, and physical activity (AAP, 2001). Habits are hard to break and television
viewing seems to be one habit families struggle with. How can television viewing be mediated
into educational, enriching, and developmentally supportive experiences? Evidence exists
promoting the idea that when used properly, television and visual media can be used to support language learning and vocabulary development (Huston et al., 1999; Kermar & Greal, 2007; Lemish & Rice, 1986; Patterson, 2002; Rice & Woodsmall, 1988; Uschikoshi, 2006).

Many attributes of television and children’s natural attraction towards television provides a foundation for learning. First, television programming often includes a variety of new and rare words in comparison to other forms of media (Hayes & Ahrens, 1988). Appendix A reports the varied word exposures in different modalities. Children’s books and cartoon shows contain comparable numbers of rare words. Exposure to rare words offers a unique learning opportunity for children. Television can also broaden a child’s world knowledge, exposing them to new worlds and ideas. Television viewing can also provide a routinized activity with predictable modeled utterances that are supportive to a child’s language development (Lemish & Rice, 1986). In addition, television is a continuous stream of content, thus when a listener is inattentive, re-establishing joint attention is less challenging than abstract object play (Lemish & Rice, 1986). Furthermore, children enjoy reruns and act out television they see (Watson-Gegeo & Boggs, 1977). In addition, toddlers are attentive to the visual and auditory stimulation of television (Kermar & Greal, 2007). Television can also facilitate play through reenactments (Huston et al., 1999). It has also been suggested that teaching involving more salient contexts including props and television is reported to be helpful in word learning (Wasik & Bond, 2001). All of these attributes underlie the attractiveness of television.

Adult interaction during television viewing is the most critical component in transforming television viewing from a harmful activity to an enriching one. Lemish and Rice (1986) observed and collected activity logs of 16 middle class families with young children ages one year two months to three years. Behaviors of both the children and adults were coded during
television viewing. Children’s verbalizations were categorized as follows: designating objects, characters, animals and other things, questioning about television content, repetition of television dialogue or parental comments, and description of television content. Parent verbalizations including designations, questions, responses to child, and descriptions were noted. Children most frequently pointed and labeled objects, unfamiliar and surprising objects, and scenes (Lemish & Rice, 1986). Parents supported their children’s participation by attention calling, labeling, and questioning (Lemish & Rice, 1986). As children aged, parents broadened their verbalizations to include questions, repetitions, and descriptions (Lemish & Rice, 1986). Clearly, interaction during television viewing is possible and is affected by four contributors: (a) the amount of adult control involved and thus the extent that the child can participate, (b) the appeal of the content, (c) the continuity of the activity or the use of interactional routines, and (c) the perceived benefit of the child’s activity for the adult (Lemish & Rice, 1986). Simply stated, if parents interact with their child while watching television, use appealing content and basic interactional routines, and find such interactions positive, their child can benefit from television viewing (Lemish & Rice, 1986).

In a study with 150 bilingual Spanish-English speaking children, television viewing did not result in incidental vocabulary learning in both languages (Uchikoshi, 2006). Rather reinforcement and repetition was suggested to increase vocabulary size (Uchikoshi, 2006). In another study exploring correlations between television viewing and vocabulary skill in English and Spanish of 64 simultaneous bilingual toddlers, impact of television viewing without parental interaction or specificity of programming type was insignificant (Patterson, 2002). However, the data was approaching significance in both languages and might be with a larger sample size or when specifying to educational programming (Patterson, 2002). For both bilingual and
monolingual children, adult-child interaction during television viewing is the only means for providing meaningful vocabulary learning.

Thus studies reveal that with adult interaction children can learn new words from television (Huston et al., 1999; Kcrmar & Greal, 2007; Lemish & Rice, 1986; Patterson, 2002; Rice & Woodsmall, 1988; Uschikoshi, 2006). However a bilingual child’s word learning experience while watching television incorporating adult interaction is unclear. This study aims to explore bilingual children’s ability to fast map in both of their languages in a cartoon narrative context.

**Fast Mapping in Two Narrative Contexts: Storybook Reading and Cartoon Presentation Modalities**

Narrative contexts, specifically cartoons, have been used in a select number of fast mapping studies. Braisby et al. (2001) explored fast mapping by school-age children in a naturalistic setting of science educational programming. A total of 233 elementary-age students watched various science education videos including 16 novel science terms. Receptive comprehension of the targets was much higher than their expressive comprehension but not vastly different than the control groups. Braisby (2001) concluded that fast mapping does not occur in naturalistic settings as demonstrated by little evidence of solid expressive word learning. Rice and colleagues explored the use of cartoons in a fast mapping task embedded in a narrative context (Rice, Buhr & Nemeth, 1990; Rice, Buhr & Oetting, 1992; Rice, Cleave, & Oetting, 2000; Rice, Oetting, Marquis, Bode, & Pae, 1994). In applying a very supportive narrative structure similar to storybooks and television programming, these studies compared the performance of typically developing monolingual children and children with specific language impairment. Children watched two different cartoons with a voice-over narration including
nonword fast mapping targets. The studies indicated that in a cartoon presentation modality, typically developing children learned more words than children with specific language impairment (Rice et al., 1990; Rice et al., 1992; Rice et al., 1994; Rice et al., 2000). Additionally, word repetition and syntactic cueing supported older children’s ability to fast map from the cartoon (Rice et al., 1994; Rice et al., 2000). Rice et al. (1992) further noted that typically-developing three to five year old monolingual children demonstrated “remarkably robust word acquisition capabilities, ones that operate virtually unassisted by adult intervention or focused interaction” (p. 1047). Although the children in these studies did not require specific adult-child interaction to support their fast mapping, the literature clearly suggests, as reviewed above, that adult elaboration in a narrative context supports word learning (Huston et al., 1999; Kermar & Greal, 2007; Lemish & Rice, 1986; Patterson, 2002; Rice & Woodsmall, 1988; Uchikoshi, 2006).

In bridging the use of fast mapping studies with bilingual children and using narrative contexts, Uchikoshi (2006) conducted an experimental study with 150 Spanish-English bilingual children who were systematically exposed to two educational television programs over a course of three weeks. Standardized vocabulary testing was conducted to compare performance before and after in both languages. Results indicated that the television viewing without adult support or elaboration did not provide incidental vocabulary learning in either language, suggesting that repetition and reinforcement from an adult would be necessary (Uchikoshi, 2006).

Literature clearly indicates that both forms of narrative presentation, television and storybook reading, can enable vocabulary learning in children when adult support and elaboration is present (Huston et al., 1999; Justice et al., 2005; Justice, 2002; Kermar & Greal, 2007; Lemish & Rice, 1986; Leseman, 2000; Patterson, 2002; Rice & Woodsmall, 1988;
Ushikoshi, 2006). However it is unclear how bilingual children learn from narrative presentations with adult support especially from storybooks and cartoons. There is a gap in the literature regarding the vocabulary learning abilities of bilingual children in these two narrative contexts, storybook reading and cartoons.

Furthermore using bilingual children in a fast mapping study allows for holding language effects constant to compare the effects of presentation modality. As stated in Kan & Kohnert (2005), “[bilingual] children offer a unique vantage point from which to consider language development and to test the nature of various relationships within and across languages” (p. 380). Further many studies have used word learning measures to explore theoretical models in bilinguals (Castilla et al., 2009; Conboy & Thal, 2006; Marchman et al., 2004; Pearson et al., 1997; Simon-Cereijido & Gutiérrez-Clellen, 2009).

Thus the focus of the current study arises. The fast mapping experimental design used with two presentation modalities can help us differentiate language learning abilities in two languages within a bilingual and help us understand how this system is constructed. How do languages interact to support word learning? What role do individual differences in language processing play? How does narrative presentation modality effect learning? Does learning in each language differ in the two presentation modalities? In essence, comparing two presentation modalities and two developing language systems can help differentiate the most salient factors contributing to word learning abilities in sequential bilingual children.

**Research Questions and Predictions**

Using a fast mapping experimental set up, a group of sequential Spanish-English bilingual preschoolers were exposed to various unfamiliar words in two different narrative contexts with adult support and elaboration. The present study explores the fast mapping skills in
bilingual preschool children in a narrative context comparing two different presentation modalities and the child’s two languages. The following questions were explored:

1. How does presentation modality affect gain performance on a fast mapping task?
2. What differences or similarities exist of fast mapping gain performance between two languages with bilingual preschoolers?
3. Does a cross-linguistic relationship exist between presentation modality and language of presentation?

It is unknown whether presentation modality will have a significant effect on word learning. Various studies have shown that children can learn from both cartoons and storybooks when adult interaction is present (Huston et al., 1999; Justice et al., 2005; Justice, 2002; Krcmar & Greal, 2007; Lemish & Rice, 1986; Leseman, 2000; Patterson, 2002; Rice & Woodsmall, 1988; Ushikoshi, 2006). It is predicted that fast mapping gain performance, the number of words learned, will be better in the child’s dominant language, likely L1 (Kan & Kohnert, 2005, 2008). The direction, amount, and nature of the interaction between the languages could either demonstrate strong interaction indicating that L1 performance supports learning in L2, or the opposite that word learning in this narrative context is independent. Further considering the effect of and controlling for the presentation modality, might reveal greater influence of underlying language processing ability or cross-linguistic bootstrapping.

**Methods**

**Participants**

Typically-developing sequential Spanish-English bilingual children were learning Spanish at home from birth (L1) then acquired English at an older age (L2) were recruited from six different Head Start classrooms in Boulder County, Colorado. Consent was collected for 27
students from six different classrooms. Due to time constraints with data collection and compliance with testing only 20 children fully participated in research. In addition, one child left the country before the testing procedure was completed and another qualified for special education services after data collection. Thus 18 typically-developing sequential bilingual preschool students, 11 females and seven males, participated in the study. The average participant age was four years four months (SD = 5.78 months), the youngest being three years three months and the oldest five years. All children attended Head Start classrooms in the Boulder, Colorado area. Participants had an average of 10 months experience in Head Start (SD = 5.5 months). Instruction was primarily in English, however a Spanish-speaking teaching assistant worked in every classroom. Class sizes ranged from approximately 12 to 20 children.

One limitation must be noted. Two children were accidently shown the same stimulus twice. This however did not seem to affect their performance in the other modality. Table 1 contains additional information regarding individual participants.

**Pre-existing vocabulary knowledge.** The Receptive One-Word Picture Vocabulary Test (ROWPVT) English (Brownell, 2010) and Spanish-English (Brownell, 2000) were used to assess the children’s pre-existing vocabulary knowledge in both languages. Each child completed the ROWPVT in English and Spanish in a randomized order. The Spanish-English ROWPVT was administered in a monolingual manner, all in Spanish. Only raw scores were recorded given that some participants were below the age-range for normative data. The ROWPVT scores in English and Spanish are very variable (English mean = 29.44, SD = 14.35, and Spanish mean = 23.72, SD = 10.71). Although mean English scores were higher, the higher standard deviation and outliers should be noted. In addition, many of these children were in various stages of English language acquisition which contributes to the variability in scores. In addition, a correlational
analysis indicated a cross-linguistic relationship between ROWPVT in English and Spanish, \( r(18) = .482, p < 0.05 \), indicating high pre-existing vocabulary knowledge in Spanish was associated with high pre-existing vocabulary knowledge in English and vice versa. See Figure 1 and Table 2 for participants’ ROWPVT raw scores in English and Spanish.

**Parent questionnaire.** In addition, a parent questionnaire was created by the primary researcher to gather information regarding home language use, language learning, television use in the home and storybook reading in the home (Appendix B). Fourteen out of 18 parents completed the questionnaire. The remaining questionnaires were completed via teacher interview by the primary researcher and thus do not contain information regarding home environment.

**Language use.** Parent report is considered a highly valid measure of language use and development in children (Marchman & Martínez-Sussmann, 2002). Many questions regarding bilingualism focused on the child’s language use in different settings and with different conversational partners. Figures 2, 3, and 4 demonstrate the reported dominant language, language used at school and language used at home of the 18 participants.

Clearly most children were considered by their parents to be Spanish dominant as measured by their home language use and reported dominant language. All children were in some stage of English language acquisition from their time at Head Start and many were considered to use both Spanish and English in the school environment. Participants started Head Start at approximately three years six months. Also 13 participants were reported to start learning English at Head Start. The remaining five participants starting learning English either from day care settings, parents who also spoke English, or older siblings.

**Storybook use in the home.** Thirteen parents completed this portion of the questionnaire. All parents reported the use of storybooks in the home with varying frequency,
ranging from every day, two to three times per week to “every once in a while”. Ten parents reported having numerous books in the home. All children demonstrated or were developing some early literacy skills per parent report including pointing at pictures in storybooks, inventing stories and acting them out, naming the alphabet and drawing or writing letters. Four parents reported that storybook reading activities occurred in Spanish, six in English, and three in both languages similar to findings by Patterson (2002). Please see Appendix C from Patterson (2002) reflecting the similar findings of reported frequency of storybook use.

*Television use in the home.* Thirteen parents completed this portion of the questionnaire. Parents reported average television viewing time per day to be 1.41 hours (sd = .66 hours), with the highest reported time three hours per day and the shortest one half hour per day. Parents reported a range of children-directed programming including cartoons, learning programs, and programming in Spanish. Eight of the 13 reports indicated that children watched television primarily in English and the remaining five indicated that children watch television in both English and Spanish similar to reports by Patterson (2002). 85% of children were reported to talk about television and only 66% to act out television they had viewed in play. Please see Appendix C from Patterson (2002) reflecting the similar findings of reported frequency of television use.

**Stimuli Development**

*Cartoon and storybook.* The cartoon stimulus was created from various *Roadrunner and Coyote* (Jones, 1949-2010) cartoons. These wordless cartoons detail the peculiar means the coyote attempts to catch the roadrunner. The coyote continually uses various unfamiliar objects such as catapults and anvils to try to catch the roadrunner. A compilation cartoon was created using iMovie (Apple Inc., 2009). The duration of the cartoon is 3:58 min. The procedures section
contains the fast mapping target and script for this particular video clip. Next, a wordless
storybook was created from the cartoon to serve as the storybook presentation stimulus. Using
iPhoto (Apple Inc., 2009), the storybook was created using screen shots of the salient points from
the cartoon. A sample storybook page demonstrating one fast mapping target is included in
Appendix D.

Fast mapping targets. Both stimuli contained eight fast mapping targets. The eight fast
mapping targets were identical in English and Spanish. The fast mapping targets included
unfamiliar nouns that were assumed unknown by preschool aged children. Pre-stimulus testing
was also conducted to ensure the unfamiliarity of the fast mapping targets. The following criteria
was met for the words to be used in both languages: word frequency of less than 500 or less, and
words of 2-4 syllable length. A corpus of spoken and written language including 410 million
words from 1990 to 2010 was used for the English word frequency values (The Corpus of
Contemporary American English (COCA)). A corpus of over 100 million words from the 1200s
to 1900s in Spanish spoken language and text was used for the Spanish word frequency counts
(Corpus de Español). Although the two corpuses are of different size and the English more
modern, they were both created by the same researcher and are the most frequently used
corpuses. These corpuses helped to select appropriate fast mapping targets. Please see Tables 3
and 4 for the fast mapping targets in English and Spanish.

Script. To provide narration to the cartoon and storybook, a script with repetitive and
structured narration was written including the eight unfamiliar words targeted in English and
Spanish. Each word occurs only once in the script with the exception of ‘anvil’. Pilot testing and
previous research indicated that children need support of adult interaction during cartoon and
storybook narration (Huston et al., 1999; Kermar & Greal, 2007; Lemish & Rice, 1986;
Thus pauses, adult comments, and pointing to the fast mapping targets were used to enhance word learning. Statements and rhetorical questions were used to draw attention to fast mapping targets (e.g. “Wow look how high he is above the road on the tight wire!” and “I wonder if the spring will work!”). During the cartoon presentation modality the examiner read the script verbatim then paused the cartoon at the appropriate time, read the pre-determined comment, pointed to the fast mapping target then continued. Thus the child heard each fast mapping target twice as it has been shown that pausing and repetition supports word learning (Rice et al., 1992; Rice et al., 1994). Each child heard the exact same narration and comments. The English script and comments were then translated into Spanish.

**Measures**

**Pre and post-stimulus test fast mapping targets.** Testing materials included a pre-stimulus test and post-stimulus test of all eight fast mapping targets. The pre-stimulus test and post-stimulus test was designed from testing materials used in previous fast mapping studies (Rice et al., 1990; Rice et al., 1992; Rice et al., 1994; Rice et al., 2000). Using a similar format to the Peabody Picture Vocabulary Test (PPVT), the identical pre and post-stimulus tests measure the child’s fast mapping target comprehension (Dunn & Dunn, 1981). The fast mapping testing materials consisted of eight pages of four images per page. Images were presented on a 8 ½ inch by 11 inch white page. Hand drawn images of fast mapping targets were traced from the cartoon. Foil images were gathered from a set of line-drawn images (Snodgrass & Vanderwart, 1980). The child was simply asked to “Show me (fast mapping target)” by pointing. Accurate answers were scored as one point and inaccurate zero. Thus each child’s score was out of eight possible points. Inter-rater reliability was strong for scoring (Cohen’s kappa, k = 0.94).
Pilot testing indicated that similar unfamiliar nouns and repetition of fast mapping targets as foils during testing was too challenging and resulted in performance below chance. Thus different foils were chosen including a visual foil, a semantic foil, and one familiar object. One visual foil appeared similar to the fast mapping target, for example “rope” for target “spring”. One semantic foil that was another unfamiliar object, for example “barrel” for “spring”. And finally one familiar object such as “apple” or “ball”. See Appendix E for a sample testing page and Appendix F for foils used on testing sheets. The identical testing sheets were shuffled to ensure randomization of order of fast mapping testing. In addition, the same testing sheets were used in English and Spanish testing.

A correlational analysis was used to find the relationship between the pre-stimulus fast mapping scores and the child’s pre-existing vocabulary knowledge as measured by the ROWPVT. Results indicated within-language correlations between pre-stimulus scores and ROWPVT scores, in English, $r (18) = .488, p < 0.05$, and in Spanish, $r (18) = .519, p < 0.05$. Thus the pre-stimulus fast mapping scores were accurate measures of the child’s vocabulary knowledge. Children with higher pre-existing vocabularies, knew more of the fast mapping targets from the start. Figures 5 and 6 demonstrate these within-language correlations in English and Spanish.

**Procedures**

A within-subject experimental design was used to explore the fast mapping ability of bilingual children comparing their performance in two languages and in two different presentation modalities. The data collection procedure consisted of two visits each with a duration of approximately 20-60 minutes. The children were tested in a quiet room outside of the classroom with a Head Start employee present. Appendix G outlines the procedures.
First visit, a language sample was collected during a brief approximately 10 minute free-play period in both languages. The language sample was conducted to help the child get comfortable with the tester and being outside of the classroom environment. Each language sample was collected immediately prior to the fast mapping procedure in that same language. Then the ROWPVT was administered. Next, a pretest of the targeted unfamiliar words was used to determine any prior knowledge before the stimulus presentation and fast mapping task. Next the subject was presented the stimulus (cartoon with live narration or storybook with live narration). Immediately following stimulus presentation the subject performed the post-stimulus test. They then repeated this same procedure in the other language. The child only performed the pre-stimulus test once in each language to reduce testing fatigue. During day two, the child performed the same procedure but with the opposite presentation modality in both languages. If at day one the child watched the cartoon, on day two they looked at the storybook and vice versa.

The language sample was recorded by using a FLIP portable camera and stored on a secure computer in Dr. Pui Fong Kan’s Child Language and Learning Laboratory in the Department of Speech Language and Hearing Sciences at the University of Colorado at Boulder. Order of presentation modality (storybook or cartoon) and presentation language (Spanish or English) was randomized. A within-subjects analysis of variance (ANOVA), was used to test the effect of presentation order, including both modality and language, on fast mapping performance. Results indicated no significant effect of presentation modality order, $F(1, 17) = .456 , p = .525$ or language order $F(1, 17) = .058 , p = .818$. Meaning that it did not matter which modality the children saw or which language was tested on the first day of testing.

The primary researcher served as the Spanish tester, conducting all procedures in Spanish. Several trained undergraduate and graduate research assistants served as English testers
and performed all procedures with children in English. Each testing day the child completed the whole procedure in both languages with one stimulus. The length of time between testing visits ranged from one day to four weeks given constraints in the testing schedule and allowable visit times at the Head Start classrooms.

The fast mapping target for this clip was ‘spring’. Below is the live narration read to the child during this cartoon segment. The adult paused the clip when the spring and coyote were in full view, read the comment, resumed play and continued narration.

RESEARCHER: “The coyote had another idea. He made a spring to shoot himself fast and catch the roadrunner.”
PAUSE / ADULT COMMENT: “I wonder if the spring will work!”
RESEARCHER: “But it didn’t work. The roadrunner got away.”

Results

In order to examine fast mapping performance, gain scores were used in most analyses. Gain scores are a basic measure of post-stimulus testing scores minus pre-stimulus testing scores within a language. Gain scores demonstrate the number of words the child learned after the stimulus presentation. A within-subjects repeated measures analysis of variance (ANOVA) comparing post-stimulus test scores only, yielded insignificant results for language, $F(1,17) = 1.959, p = .180$, and presentation modality, $F(1,17) = .056, p = .816$. Thus gain scores most accurately reflect the learning process of fast mapping in this cohort. A repeated measures ANOVA was used to compare the two presentation modalities (cartoon versus storybook) and the two language conditions (Spanish and English) of the fast mapping gain performance.

Results below are organized per research question and per additional analyses.

**Question One.** How does presentation modality affect gain performance on a fast mapping task? Results showed no effect of presentation modality on fast mapping gain performance, $F(1,17) = 0.56, p = .816$. There were no differences in fast mapping gains between
the cartoon and the storybook presentation modalities. Performance post cartoon and post storybook were comparable.

**Question Two.** What differences or similarities exist of fast mapping gain performance between two languages with bilingual preschoolers? Results when considering fast mapping gain performance showed a significant language effect, \( F(1,17) = 8.824, p < .01, d = .871 \). The mean gain in fast mapping performance was higher in L1 (mean = 2.89, SD = 1.86) than in L2 (mean = 1.27, SD = 2.15). Due to lower pre-stimulus fast mapping scores (mean = 1.94, SD = 1.16), gains were more significant in Spanish. Pre-stimulus fast mapping scores in English were generally higher (mean = 3.22, SD = 2.01), but these gain scores in English did not demonstrate the same learning trend. English scores were more variable reflecting the children’s various stages of English acquisition. Figures 7, 8, 9, and 10 indicate the substantial fast mapping gains regardless of modality in Spanish in comparison to English. Learning trajectories are plotted for each child.

Upon visual inspection of the graphs L2 performance pre and post is quite variable. Significant language differences occurred in the pre-stimulus testing scores alone, \( F(1,17) = 7.389, p < .05 \), demonstrating the variability in English pre-stimulus testing scores possibly skewing fast mapping gains analyses. Additional analyses were conducted to remove abnormally high pre-stimulus test English-scoring subjects. Surprisingly, these outliers did not affect overall language differences in performance, \( F(1,17) = .285, p = .601, d = .79 \). These outliers are actually required for significant language effects to remain in the fast mapping gain performance.

**Question Three.** Does a cross-linguistic relationship exist between presentation modality and language of presentation? The results when considering fast mapping gain performance did not show a language and presentation modality interaction, \( F(1,17) = .124, p = .729 \). However, a correlational analysis incorporating only post-stimulus testing scores indicated a significant
cross-linguistic relationship within a presentation modality, cartoon modality, $r(18) = .644, p < .005$, and in the storybook modality, $r(18) = .856, p < 0.001$. Demonstrating that children who performed well in L1 also did in L2 regardless of presentation modality. Both presentation modalities show the same cross-linguistic relationship. Figures 11 and 12 demonstrate this cross-linguistic relationship.

**Additional Analyses.** Throughout testing, regardless of age or maturity level, some children demonstrated fatigue and non-compliance during post-stimulus testing. Some children would perseverate on one quadrant of the testing sheets, seemingly choosing the same quadrant despite the changing target. Others would demonstrate their fatigue by laying on the floor and haphazardly selecting a response. Most children responded to verbal encouragement and redirection. However, fatigued and non-compliant children were noted. Six out of 18 subjects were considered fatigued and non-compliant during some aspect of testing. An additional repeated measures analysis of variance (ANOVA) using fast mapping gain scores was used to determine the effect of fatigue. Fatigue and non-compliance did not significantly affect fast mapping gain performance, $F(1,17) = .802, p = .405$.

Additionally, each child’s months in Head Start was calculated as a means to measure their experience in a formal school setting and their exposure to English. The results indicated that the child’s months in Head Start did not significantly affect fast mapping gain performance, $F(1,17) = 1.748, p = .205$. Age was considered another possible influence on fast mapping performance. The child’s age did not significantly affect fast mapping performance, $F(1,17) = 1.209, p = .288$, further supporting results discussed previously.

**Summary of Results.** There was no significant difference in the fast mapping gain performance between the storybook and cartoon. Children learned equally well in both
presentation modalities. Additionally, children performed better in L1, demonstrating more substantial gains or learning trajectories. The following factors did not contribute to their performance: age, months in Head Start, or testing fatigue. Finally, a cross-linguistic relationship was found in both presentation modalities. Demonstrating that children who performed well in L1 also did in L2.

**Discussion**

The nature of the within-subjects design, using multiple languages and presentation modalities, resulted in each child viewing the stimulus a total of four times, two times per language. As seen above results can be compared on various levels, such as comparing within language performance between two presentation modalities. There was no significant difference in performance between the two presentation modalities. Testing the two modalities resulted in a sense two supporting data sets, further enhancing and supporting the languages differences found in fast mapping performance. Conducting two presentation modalities could also have enhanced performance by simply increasing exposures to the fast mapping targets supporting overall learning (e.g., Marchman et al., 2004). As Marchman et al. (2002) reported that increased exposures to words increases overall vocabulary. Regardless of the underlying cause, the data sets in both presentation modalities are highly comparable and enhance the meaning of the language differences.

The fast mapping gain performance suggests a significant language difference. Children clearly showed stronger learning trajectories in L1. As seen in the range of English pre-stimulus testing and post-stimulus testing scores, many of these children were in various stages of English language acquisition. This is an extremely realistic finding. Bilingual children’s skills are extremely diverse and are influenced by a variety of experiences and the individual’s underlying
language processing ability (Pearson & Fernández, 1994; Pearson et al., 1993; Umbel et al., 1992). Individual differences were also great. About four children were reported to have transferred to using primarily English, while the remaining 14 were still predominately Spanish-speaking. Further their abilities to attend to testing varied widely. Regardless of where the child’s English skills were on this continuum, the group as a whole learned robustly in L1. This ability to learn in L1 is likely due to their strong language base and support in L1. In essence, vocabulary knowledge in L1 supported word learning in L1. This demonstrates support of the language specificity of word learning theoretical model (Marchman et al., 2004; Simon-Cereijido & Gutiérrez-Clellen, 2009; Gutiérrez-Clellen, 1999). This provides further evidence that L1 support is critical during language development even during varied English acquisition stages (Simon-Cereijido & Gutiérrez-Clellen, 2009; Gutiérrez-Clellen, 1999; Winsler et al., 1999). This support can be provided by parents and caregivers during interactional storybook reading and television viewing activities.

Surprisingly, there was no cross-linguistic relationship found when comparing fast mapping gain performance. It appears that learning as reflected by the gain score, was so robust in Spanish that it only supported learning in Spanish and not English. This could be due to the variability in the English skills and individual differences in the group. However, there is a clear cross-linguistic relationship in fast mapping performance when using post-stimulus testing scores, in both the storybook and cartoon modality. Children who performed well in Spanish also did well in English and vice versa. Similar to conclusions of Rice & Woodsmall (1988), children with accumulated linguistic knowledge and/or prior viewing experience were able to learn more words. Accumulated linguistic knowledge can be comparative to a bilingual child’s cumulative language knowledge. As mentioned in Robbins & Ehri (1994) with storybook reading, the “rich
get richer”. This framework can also be applied to bilinguals. Bilingual children with a larger vocabulary in L1 are likely to learn more vocabulary in L2 (Castilla et al., 2009; Conboy & Thal, 2004). In this study the “rich got richer” regardless of presentation modality; the ability was due to the child’s language processing ability. This accumulated linguistic knowledge reflects the linguistic interdependence and cross-linguistic bootstrapping models of bilingual language development (Castilla et al., 2009; Conboy & Thal, 2004). The cross-linguistic relationship also indicates the interaction of languages and the continuity of knowledge between L1 and L2 within a bilingual child (Kohnert, Kan, & Conboy, 2010).

Which theoretical model prevails, language specificity of word learning or linguistic interdependence? In reality this study demonstrates both. Accumulated L1 knowledge supports acquisition of new words in L1. Furthermore, children who demonstrated higher L1 fast mapping performance also did in L2. What makes these children different? Language processing ability paired with previous knowledge, might be the underlying factors contributing to this cross-linguistic finding. As stated by Castilla et al. (2009), “linguistic interdependence is based not on what has been learned already but on the underlying abilities that differentiate learning rates in a population” (p. 577). It may be a unique combination and/or interaction of language processing and previous knowledge that supports cross-linguistic bootstrapping, as Conboy and Thal (2006) states, “maturational and conceptual development alone cannot account for the advances in grammatical development in this age range [toddlers]” (p. 728). Further, another variable is critical, language dominance (Conboy & Thal, 2006). There is clearly not one factor alone to explain cross-linguistic interdependence. Rather each child brings a unique combination of language processing ability, previous knowledge, and language dominance. This unique
combination of ability and skill allows them to learn new vocabulary from various modalities in each of their languages at different rates.

Considering clinical implications is a critical and practical step in research. As mentioned above, there was no significant difference in gain performance between the two presentation modalities. Bilingual children learned equally well from the cartoon as they did from the storybook when adult interaction and elaboration was included. Television viewing, regardless of what language is being spoken, can support word learning only if an adult talks with the child about what they are watching (Lemish & Rice, 1986; Rice & Woodsmall, 1988). Regardless of the parent’s English proficiency, discussion and elaboration in Spanish will support continued language development and establish a strong base in L1 (Castilla et al., 2009). Furthermore, storybook reading in either language with adult interaction supports word learning as found with monolingual children (Justice, 2004; Justice et al., 2005). In addition, studies have shown that Mexican American mothers interact with their children differently than mainstream Caucasian middle class mothers during storybook reading experiences (Rodríguez, Hines, & Montiel, 2009). Mexican American mothers employed interactive shared storybook reading strategies to different degrees, ranging from enhancing their children’s attention to the printed text, to rarely using strategies such as elaborating on their children’s ideas or comments (Rodríguez et al., 2009). These mothers did provide feedback and descriptions more frequently than asking questions (Rodríguez et al., 1999). Additionally, storybook reading interactions are influenced by beliefs, practices, the level of engagement in their child’s education, parent’s own history of literacy, and the encouragement of reading from the family’s school environment in a group of Mexican immigrant parents (Gillanders & Jiménez, 2004). There are clearly cultural differences during storybook reading type interactions. Ard and Beverly (2009) suggest that commenting
may be a more natural interactional routine for diverse mothers during storybook reading. Given the prevalence of television, supporting interactional activities and conversation during television viewing might be a more appropriate and familiar medium for such mothers. As mentioned earlier, parent-child interaction during television viewing is a key component (Chochaiya & Pruksananonda, 2008; Kirkorian et al., 2009; Pempek et al., 2007). Not only is it important to consider what presentation modality a child prefers, but the parent’s preferred modality must also be considered to setup an engaging interaction. Families will likely continue watching television with the same frequency as before. Some parents might also be more comfortable with television given their limited familiarity with storybooks. Instead of condemning television viewing, parents should be encouraged to at least co-view television (especially educational television geared towards children) and discuss what they are watching by commenting, encourage their children to comment, ask questions, and even act out the television they see.

**Limitations and Future Studies**

Some brief limitations and ideas for future studies are discussed. The use of real words presents a possible effect as many word learning studies use nonwords. Additionally, word length, frequency, and familiarity must be considered in selecting fast mapping targets. Although vocabulary comprehension testing is relatively less cognitively demanding for children, participants in this study were tested a total of five times, possibly causing a testing effect. Future studies using preschool-aged children might consider reducing testing as much as possible. The individual variability was great in the children’s ability to attend to testing and not become fatigued. A position bias might also have occurred during the fast mapping target testing. In that some children appeared to perseverate on a particular quadrant of the testing sheets. Randomized positions of the fast mapping targets on the testing sheets could resolve this issue.
Future studies might explore how to encourage parents, both of monolingual and bilingual children, to use interactional strategies during television viewing. Practical and simple strategies must be developed further in order for parents to adapt them. Additionally, it would be interesting to explore the preferred medium of interaction for minority language speaking parents. From a clinical perspective, exploring fast mapping performance in both languages within a narrative context with bilingual language-impaired children in comparison to typically-developing children is a potential next step. Efficacy of the fast mapping task, whether in a cartoon or storybook context, would need to be tested as potential screening tool as other researchers have suggested (e.g., Ellis Weismer & Evans, 2002).
References


Table 1

*Participant Information*

<table>
<thead>
<tr>
<th>Subject</th>
<th>Gender</th>
<th>Age</th>
<th>Learned English in Head Start?</th>
<th>Months in Head Start</th>
<th>Questionnaire Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>B01</td>
<td>M</td>
<td>4;8</td>
<td>Y</td>
<td>8</td>
<td>P</td>
</tr>
<tr>
<td>B02</td>
<td>M</td>
<td>4;4</td>
<td>Y</td>
<td>13</td>
<td>P</td>
</tr>
<tr>
<td>B03</td>
<td>F</td>
<td>3;3</td>
<td>Y</td>
<td>3</td>
<td>P</td>
</tr>
<tr>
<td>B04</td>
<td>F</td>
<td>4;11</td>
<td>Y</td>
<td>5</td>
<td>T</td>
</tr>
<tr>
<td>B05</td>
<td>M</td>
<td>4;6</td>
<td>Y</td>
<td>3</td>
<td>T</td>
</tr>
<tr>
<td>B08</td>
<td>M</td>
<td>4;5</td>
<td>Y</td>
<td>14</td>
<td>P</td>
</tr>
<tr>
<td>B10</td>
<td>M</td>
<td>4;0</td>
<td>Y</td>
<td>3</td>
<td>P</td>
</tr>
<tr>
<td>B12</td>
<td>F</td>
<td>4;9</td>
<td>Y</td>
<td>18</td>
<td>P</td>
</tr>
<tr>
<td>B13</td>
<td>F</td>
<td>3;8</td>
<td>Y</td>
<td>9</td>
<td>P</td>
</tr>
<tr>
<td>B14</td>
<td>M</td>
<td>4;7</td>
<td>N</td>
<td>10</td>
<td>T</td>
</tr>
<tr>
<td>B17</td>
<td>F</td>
<td>4;9</td>
<td>Y</td>
<td>9</td>
<td>T</td>
</tr>
<tr>
<td>B18</td>
<td>F</td>
<td>3;11</td>
<td>N</td>
<td>8</td>
<td>P</td>
</tr>
<tr>
<td>B19</td>
<td>M</td>
<td>4;11</td>
<td>Y</td>
<td>20</td>
<td>P</td>
</tr>
<tr>
<td>B20</td>
<td>F</td>
<td>4;11</td>
<td>N</td>
<td>8</td>
<td>P</td>
</tr>
<tr>
<td>B21</td>
<td>F</td>
<td>4;2</td>
<td>Y</td>
<td>11</td>
<td>P</td>
</tr>
<tr>
<td>B22</td>
<td>F</td>
<td>3;11</td>
<td>Y</td>
<td>8</td>
<td>P</td>
</tr>
<tr>
<td>B25</td>
<td>F</td>
<td>5;0</td>
<td>N</td>
<td>21</td>
<td>P</td>
</tr>
<tr>
<td>B26</td>
<td>F</td>
<td>4;5</td>
<td>N</td>
<td>14</td>
<td>P</td>
</tr>
</tbody>
</table>

*Note.* Age = Years; Months, Y = Yes, N = No, P = Parent completed, T = teacher interview.
Figure 1. Cross-linguistic relationship of pre-existing vocabulary knowledge as measured by ROWPVT.
Table 2

*RWPVT Raw Scores in English and Spanish*

<table>
<thead>
<tr>
<th>Subject</th>
<th>English</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>B01</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td>B02</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>B03</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>B04</td>
<td>42</td>
<td>29</td>
</tr>
<tr>
<td>B05</td>
<td>19</td>
<td>22</td>
</tr>
<tr>
<td>B08</td>
<td>59</td>
<td>9</td>
</tr>
<tr>
<td>B10</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>B12</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>B13</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>B14</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>B17</td>
<td>27</td>
<td>29</td>
</tr>
<tr>
<td>B18</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>B19</td>
<td>44</td>
<td>35</td>
</tr>
<tr>
<td>B20</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>B21</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>B22</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>B25</td>
<td>53</td>
<td>50</td>
</tr>
<tr>
<td>B26</td>
<td>47</td>
<td>30</td>
</tr>
</tbody>
</table>
Figure 2. Reported dominant language of participants.
Figure 3. Reported language used most frequently at school.
Figure 4. Reported language used most frequently in the home.
Table 3

*Fast Mapping Targets: English*

<table>
<thead>
<tr>
<th>Word Frequency</th>
<th>Syllables</th>
</tr>
</thead>
<tbody>
<tr>
<td>tight wire</td>
<td>9</td>
</tr>
<tr>
<td>catapult</td>
<td>304</td>
</tr>
<tr>
<td>slingshot</td>
<td>265</td>
</tr>
<tr>
<td>teeter totter</td>
<td>26</td>
</tr>
<tr>
<td>anvil</td>
<td>426</td>
</tr>
<tr>
<td>spring</td>
<td>3254(^{(spoken)})</td>
</tr>
<tr>
<td>train tracks</td>
<td>2</td>
</tr>
<tr>
<td>caboose</td>
<td>126</td>
</tr>
</tbody>
</table>

\(^a\) Corpus of Contemporary American English

[http://corpus.byu.edu/coca/](http://corpus.byu.edu/coca/)
Table 4

*Fast Mapping Targets: Spanish*

<table>
<thead>
<tr>
<th>Word</th>
<th>Word Frequency</th>
<th>Syllables</th>
</tr>
</thead>
<tbody>
<tr>
<td>alambre</td>
<td>327</td>
<td>3</td>
</tr>
<tr>
<td>catapulta</td>
<td>304</td>
<td>4</td>
</tr>
<tr>
<td>tirador</td>
<td>58</td>
<td>3</td>
</tr>
<tr>
<td>subibaja</td>
<td>N/A</td>
<td>4</td>
</tr>
<tr>
<td>yunque</td>
<td>138</td>
<td>2</td>
</tr>
<tr>
<td>resorte</td>
<td>240</td>
<td>3</td>
</tr>
<tr>
<td>senda</td>
<td>1568</td>
<td>2</td>
</tr>
<tr>
<td>furgón de cola</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

*Corpus de Español, [http://www.corpusdeespanol.org/x.asp](http://www.corpusdeespanol.org/x.asp)*
Figure 5. Correlation between pre-existing vocabulary scores as measured by the ROWPVT and pre-stimulus fast mapping scores in English.
Figure 6. Correlation between pre-existing vocabulary scores as measured by the ROWPVT and pre-stimulus fast mapping scores in Spanish.
Figure 7. Individual fast mapping gains in the cartoon modality in English. PREE indicates pre-stimulus fast mapping scores and POSTCE indicate post-cartoon stimulus fast mapping scores.
Figure 8. Individual fast mapping gains in the cartoon modality in Spanish. PRES indicates pre-stimulus fast mapping scores and POSTCS indicate post-cartoon stimulus fast mapping scores.
Figure 9. Individual fast mapping gains in the storybook modality in English. PREE indicates pre-stimulus fast mapping scores and POSTBE indicate post-storybook stimulus fast mapping scores.
Figure 10. Individual fast mapping gains in the storybook modality in Spanish. PRES indicates pre-stimulus fast mapping scores and POSTBS indicate post-storybook stimulus fast mapping scores.
Figure 11. Cross-linguistic relationship between languages in the cartoon modality.
Figure 12. Cross-linguistic relationship between languages in the storybook modality.
Appendix A

Table A1

*Hayes & Ahrens (1988)*

<table>
<thead>
<tr>
<th>Text Type</th>
<th>Number rare words per 1,000 tokens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children’s Books</td>
<td>30.9</td>
</tr>
<tr>
<td>Preschool Books</td>
<td>16.3</td>
</tr>
<tr>
<td>Popular primetime children’s shows</td>
<td>20.2</td>
</tr>
<tr>
<td>Cartoon shows</td>
<td>30.8</td>
</tr>
</tbody>
</table>

Appendix B

Parent Questionnaire

LANGUAGE
What languages does your child speak at home?
What language(s) does your child speak at school?
Which language does your child feel more comfortable speaking?
In which language does the child feel he/she has better skills?
Did your child start to learn English at Head Start Preschool?
At what age did your child start attending Head Start?
How much of your time is used speaking Spanish…English?
What language does your child use with siblings and family?
What language does your child use with other children/friends?
What language does your child read/write?
What language does your child watch on TV or video?

EARLY LITERACY
How often do you read to your child?
Do you have lots of children’s books available for your child?
Does your child independently point to or talk about pictures when you read stories?
Does your child make up stories and tell them?
Does your child name letters of the alphabet?
Does your child draw/write letters?

TELEVISION
Does your child watch TV or movies?
   How many hours per day?
   What show does your child watch the most?
Is the TV frequently on if no one is watching or is the TV only on when someone is watching?
Does your child ever talk about the TV they watch?
Does your child ever act out the TV they watch?
Appendix C

Table C

Patterson (2002)

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Reported Frequency</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Reading</td>
<td>1</td>
<td>4</td>
<td>14</td>
<td>13</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Television</td>
<td>2</td>
<td>7</td>
<td>14</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>Spanish</td>
<td>Reading</td>
<td>16</td>
<td>13</td>
<td>18</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Television</td>
<td>9</td>
<td>10</td>
<td>16</td>
<td>11</td>
<td>18</td>
</tr>
</tbody>
</table>

Appendix D

Figure D1. Sample storybook page.
Appendix E

Figure E1. Sample testing sheet.
## Appendix F

**Table F**

*Fast Mapping Targets Testing Sheets Including Foils*

<table>
<thead>
<tr>
<th>Slide #</th>
<th>Quadrant 1</th>
<th>Quadrant 2</th>
<th>Quadrant 3</th>
<th>Quadrant 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>spring</strong></td>
<td>rope (VF)</td>
<td>apple</td>
<td>barrel (SF)</td>
</tr>
<tr>
<td>2</td>
<td>wall (SF)</td>
<td>clothesline (VF)</td>
<td>chair</td>
<td><strong>tightwire</strong></td>
</tr>
<tr>
<td>3</td>
<td>swing (VF)</td>
<td><strong>slingshot</strong></td>
<td>rocket (SF)</td>
<td>fork</td>
</tr>
<tr>
<td>4</td>
<td>road (VF)</td>
<td>steamroller (SF)</td>
<td><strong>tracks</strong></td>
<td>plate</td>
</tr>
<tr>
<td>5</td>
<td>gear (SF)</td>
<td><strong>anvil</strong></td>
<td>ball</td>
<td>rock (VF)</td>
</tr>
<tr>
<td>6</td>
<td>slide (VF)</td>
<td><strong>teetertotter</strong></td>
<td>fan (SF)</td>
<td>bucket</td>
</tr>
<tr>
<td>7</td>
<td>shirt</td>
<td>arrow (SF)</td>
<td>wheelbarrow</td>
<td><strong>catapult</strong></td>
</tr>
<tr>
<td>8</td>
<td>doll</td>
<td>balloon (SF)</td>
<td><strong>caboose</strong></td>
<td>tractor (VF)</td>
</tr>
</tbody>
</table>

*Note.** VF = visual foil. SF = semantic foil. Fast mapping targets are bolded.
Appendix G

*Figure F1.* Outline of procedures day one and day two.