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**The Thesis Committee for Kerry Elisabeth Fitzpatrick  
Certifies that this is the approved version of the following thesis:**

**Morphosyntactic Priming in Bilingual Children**

**APPROVED BY  
SUPERVISING COMMITTEE:**

**Supervisor:**

---

Lisa M. Bedore

---

Elizabeth D. Peña

**Morphosyntactic Priming in Bilingual Children**

**by**

**Kerry Elisabeth Fitzpatrick, B.A.**

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## **Dedication**

This thesis is dedicated to my Dad, Mom, and sister Kate for their constant support, love, and patience throughout my education. Also, to my “Texas Family”, for their unconditional friendship, laughter, comfort and adventures, which created my positive memories of Austin. To my colleagues in the Masters of communication sciences and disorders class of 2011, for your camaraderie, commiseration, and collaboration throughout our graduate school experience.

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## **Abstract**

### **Morphosyntactic Priming in Bilingual Children**

Kerry Elisabeth Fitzpatrick, M.A.

The University of Texas at Austin, 2011

Supervisor: Lisa M. Bedore

Limited information exists regarding the acquisition of syntax and morphology in young Spanish-English bilingual language learners. A method to measure short-term language learning is through structural priming; an auditory model of the target structure is presented, which influences a subject's subsequent production. The purpose of this thesis was to develop and pilot priming tasks in both English and Spanish to analyze the language production of typically developing bilingual elementary school students. The morphosyntactic structures targeted in the structural priming task included the third person singular and past tense in English, as well as direct object clitics and imperfect tense in Spanish. The study included three participants, aged 4;7, 6;7, and 10;11. Results revealed that bilingual elementary students with varied language exposure are influenced and learn from morphosyntactic priming.

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## **Introduction**

As the United States population transforms and grows, the presence of bilingualism amongst school-aged students in the school system increases. In 1993, 13% of all public school children were Latino, this increased to 20% by the 2005 school year (Fry, 2007). According to the most recent data available, the U.S. Census estimated that in 2008 there was almost 49 million students enrolled primary or secondary public schools in the United States (U.S. Census Bureau, 2011). Of this population, an estimated 10.9 million students spoke a language other than English at home, and for 7.8 million of those students, that language was Spanish (U.S. Census Bureau, 2011).

School systems have difficulty accurately identifying Hispanic children in need of special education services often due to the child's bilingual status (Guiberson, 2009). There is a lack of bilingual language assessment instruments that evaluate a child's comprehension and production of both languages simultaneously. Bilingual children are at a greater risk than monolingual children to be misidentified as language impaired because of the fluctuating dual language influence and limited data that is available regarding developmental norms for bilingual language acquisition in school aged children (Bedore & Peña, 2008). Furthermore, Hispanic children are more often referred for special education evaluations than Caucasian children, even though more Caucasian children qualify for services than Hispanic children (Guiberson, 2009). Of the Hispanic children identified as having a disability, more are diagnosed with a speech-language impairment or a learning disability, whereas less are deemed mentally retarded

(Guiberson, 2009). In a study of 11 urban school districts in California it was found that children learning English as a language second to Spanish, those in grades K-5 were underrepresented in special education, while children in grades 6-12 were over represented (Guiberson, 2009).

Currently, a bilingual child's language abilities are assessed in either language independently. Then, the examiner must compare the results of the testing from either language, differentiate between typical and unexpected errors; then determine, based on their knowledge and experience, if the child produced errors that were a reflection of influence from the other language, versus language impairment. This current identification method is insufficient in terms of normative and evidence-based bilingual language development data.

Given the growing population of Spanish-English bilingual children in the U.S. education system, it is necessary to understand the learning process in which children acquire two or more languages. Knowledge of how bilingual language skills typically evolve in children would provide insight to the changes in language comprehension as well. Data regarding the patterns of children's bilingual language acquisition would aid speech language pathologists in the development of effective intervention techniques. This has implications for the treatment of bilingual children with LI.

## **BILINGUAL LANGUAGE ACQUISITION**

Grammatical development in typical children increases in complexity as a function of age. The acquisition of morphosyntax is dependent on a child's exposure to

language (input) (Huttenlocher, Vasilyeva, & Shimpi, 2004). Furthermore, research suggests that language expression (production or output) is important for performance on measures of semantic and morphosyntax proficiency. Thus, children need to practice the production of the morphological structures they hear in their environment in order to master and appropriately manipulate those inflections themselves (Bohman, Bedore, Peña, Mendez-Perez, & Gillam 2010). There is normative data for the expected pattern in which a monolingual English child will incorporate varying grammatical features in their expressive language. However, this does not exist for the morphosyntactical acquisition of Spanish-English bilingual language learners. Because of this, bilingual children are often compared to monolingual norms, which are not representative of the unique language acquisition and environment of bilingual children (Bedore & Peña, 2008).

Currently, the majority of bilingual language learners in the U.S. are sequential, exposed only to Spanish since birth and not until they enter community, are they exposed to English. There is evidence to indicate that in preschool, sequential bilingual children experience cross domain associations, that is, a reciprocal relationship between gains in vocabulary and increased morphological complexity. Therefore, the mechanisms required to learn the first language improve the acquisition of the second (Kohnert, Kan, & Conboy, 2010). As bilingual children age, there is a greater demand for them express themselves and to comprehend abstract and academic concepts in English. Therefore, there is a shift in dominance from L1 to L2 (Kohnert & Bates, 2002). Kohnert and Bates (2002) conducted a cross-sectional study of sequential Spanish- English bilingual

children within 5 age groups that spanned between kindergarten and college. Prior to 11 years of age, the children demonstrated balanced comprehension and production in either language, however at 11, the subjects demonstrated stronger comprehension of English. This demonstrates there is a shift in dominance that occurs by modality (comprehension first, then production). They also found that L2 proficiency grows at a faster rate than L1 overtime and continues to increase, resulting in an eventual L2 dominance in both modalities of comprehension and production (Kohnert & Bates, 2002).

For young monolingual Spanish-speaking children, the earliest stage of Spanish grammar development is marked by low frequency verbs that are produced in one specific morphological form and word order (Sebastián, Soto, & Gathercole 2001). Then they begin to incorporate different morphological structures of the same verb, within a distinct word order (ex. *roto, rompé/broken, I broke*). Next, children increase syntactic complexity when they produce transitive verbs with an object, which indicates a subject acting upon an object (ex. *rompé la muñeca/I broke the doll*). However, it is not until after this stage of language development that Spanish-speaking children begin to produce verbs in utterances with a variety of syntactic orders. This developmental pattern suggests that children first produce verbs in a sentence structure that is word specific and as their lexicon increases, so does the complexity and variety of syntactic structure (Sebastián, et al. 2001).

Children's bilingual language acquisition accelerates and decelerates based on their language exposure and use. Input of the home language relies on a parent's proficiency as well as the contexts of exposure within the community (Bohman, et al,

2010). Research indicates that bilingual children can differentiate between their two languages from young age. However, their two language systems are not completely independent (Vasilyeva, et al., 2009). Therefore, bilingual children should have their abilities in both languages assessed simultaneously with consideration of the interaction between the two languages (Bedore & Peña, 2008).

A manner to detect children with language impairment is to observe their comprehension and production of bound morphology. Bound morphology refers to the grammatical markers that inflect information to the root of words related to number, time, person, or gender. Children with language impairment may not acquire age-appropriate syntactical structures (word order in phrases) despite typical input from adults in their environment. Furthermore, there is evidence to suggest that children with Specific Language Impairment (SLI) produce more errors in bound morphology than typical language learners (Sanz-Torrent, Serrat, Andreu, & Serra, 2008). These language-learning difficulties are most evident and common for select structures in both English and Spanish. Therefore, children with SLI can be identified through comparing their grammatical and syntactic production to developmental norms. There is a need to investigate the production of morphological and syntactic markers to establish the typical development of bilingual language learning, in order for speech language pathologists to treat children with impaired language.

## **STRUCTURAL PRIMING**

An effective method to examine the morphology and syntax of a child in any language is through structural priming. Structural priming is a person's tendency for to produce the same syntactic structure that they had recently heard (Boston, 2009). What the speaker hears is the "prime sentence" and what they in turn produce is the "target sentence" (Leonard, 2010). The "target sentence" presents with the same word order as the prime, yet reflects different word choice and meaning (Bock, Dell, Chang, & Onishi, 2007). For example, an adult interacting with a child produced a prime sentence "I see the girl is running in the grass". Given the structural priming paradigm, the child is more likely to produce their next observation with the same syntactic structure, such as "I see the dog is jumping in the mud". The child maintained the same exact word pattern in their production as the adult thus the structure is considered to be primed. Whereas if the child replied with "The dog jumps in the mud", the sentence structure of the target is different from the prime and thus the priming effect did not hold true.

Syntactic priming occurs in both naturalistic and research settings and is applicable across various syntactic structures and languages (Ferreira & Bock, 2006). The priming paradigm has been observed and investigated in people aged four through adulthood (Hupp & Jungers, 2009; Snedeker & Thothathri, 2008). In Hartsuiker, et al.'s (2004) study of 15 Spanish- English bilingual females between the ages of 19 and 38, they found that the subjects were more likely to produce English passive sentences following a passive sentence in Spanish, than other Spanish sentence types. This demonstrated interaction between comprehension and production within the subjects' two

languages and a cross-linguistic syntactic priming effect for bilingual adults (Hartsuiker, et al., 2004). Furthermore, Schoonbaert, et al., (2007) found that structural priming occurs in the language production of 5 and 6-year-old bilingual children, within their first and second language, as well as across languages. This indicates that a bilingual child's linguistic representation is similar to that of an adult; therefore, structural priming is an appropriate method to investigate morphological and syntactic development in bilingual children (Schoonbaert, et al., 2007).

Snedeker and Thothathri (2008) investigated the developmental pattern of syntax acquisition, as it relates to the priming effect in young children. They determined that the earliest syntactic productions were verb-centric and throughout the preschool years children acquired more abstract and complex sentence patterns. Shimpi, Gámez, Huttenlocher, and Vasilyeva (2007) found that children age four could mimic the sentence structure of a prime, however three-year-olds did not demonstrate priming effects unless they first repeated the prime sentence. So, a four-year-old could hear the passively structured prime "The flower was watered by the rain" and then produce the target "The dirt was dumped by the truck". However, a three-year-old would first have to repeat, "The flower was watered by the rain" in order to be effectively primed to produce the passive structure in their target phrase. Furthermore, the four-year-olds were capable of producing abstract target sentences and generalizing the conjugation of verbs across primed sentences (Snedeker & Thothathri, 2008). For example, a four-year old could produce a target "The car was buried by the snow", but a three-year-old would have difficulty with this, not only because of the abstract nature of the verb, but also

generalizing the past tense structure *-ed* to a relatively low incidence verb “bury”.

### **GRAMMATICAL DEVELOPMENT IN BILINGUAL CHILDREN**

Typically, children first produce single words and then with age and experience, increase the length and complexity of those productions. They develop a repertoire of bound morphological inflections. In English, early morphemes are the present progressive *-ing* and the plural *-s*, while in American Spanish it is the present and preterite tense structures that develop first (Bedore & Peña, 2008). This is what expected for monolingual children; however the pattern of morphological acquisition for children learning two languages may be different based on the length, amount, age, and context of first exposure to each language, as well as the interaction between the languages (Bedore & Peña, 2008).

Without concrete knowledge of a developmental timeline for bilingual language acquisition, it is important to identify the morphological and syntactical characteristics that are expected in typically developing children and often produced erroneously by children with SLI (Bedore & Peña, 2008). Sanz-Torrent, et al. (2008) discovered that children with SLI are more likely to produce a target sentence with an infinitive verb and fewer morphological markers, compared to their typically developing peers. Generally children with SLI are deficient in their production of plurals, gender, verb inflection, and frequently omit words, most notably, copulas (Sanz-Torrent, et al., 2008). There are common errors in sentence structure seen in the language production of children in both English and Spanish.



English speaking Children with SLI frequently omit the bound morphemes indicating verb inflection, such as in English the past tense *-ed* and 3<sup>rd</sup> person singular *-s* (Sanz-Torrent, et al, 2008). Furthermore, Sanz-Torrent, et al. (2008) observed that children with SLI often omitted function words and unstressed syllables, and did not produce verbs in the future or conditional tense, while their typically developing peers did.

Common errors in Spanish speaking children with SLI include errors with clitics and articles, over regularization of verbs and difficulty with morphemes indicating person number (Bedore & Peña, 2008). Studies show that bilingual children produce the same types of errors as their monolingual Spanish-speaking peers. Eagleson investigated morphological clinical markers in bilingual Spanish-speaking children (2010). It was determined that the conditional tense was the most difficult verb inflection, with the subjunctive tense ranking as highly difficult as well (Eagleson, 2010). Direct object clitics were relatively difficult and children with language impairment did not accurately produce these in a priming task (Eagleson, 2010).

## **PRIMING AND IMPLICIT LEARNING**

Implicit learning is a mechanism considered responsible for the phenomenon of structural priming. Implicit learning is the process of unconsciously acquiring knowledge through experience; this knowledge persists. As it relates to priming, implicit learning of syntactic structure is through auditory input, which is maintained despite intervening information and time. The tacit knowledge gained through audition is reflected in later

language production (Bock, Dell, Chang, & Onishi, 2007). Ferreira and Bock (2006) determined that the prime sentence is learned; that is, the sentence structure that is heard is retained and serves as a model for future productions of appropriate word order for statements with similar meaning (in terms of agent action interaction and abstract features). Therefore, the priming effect is considered implicit learning because it engages procedural memory to incidentally acquire complex and abstract sentence structures during the performance of a task (Chang, Dell, Bock, & Griffin, 2000).

During the implicit learning that occurs with priming, the two cognitive processes of comprehension and production are interacting as one system (Bock, Dell, Chang, & Onishi, 2007). Ferreira and Bock (2006) determined that priming effects are strongest for those structures that are unknown (Leonard 2010). Therefore, through the experience of producing the unfamiliar phrase word order, the strength of language mapping between the meaning and linguistic structure increases (Leonard 2010). This establishes a syntactic sequencing system that allows for dynamic “structural frames”, in which words are inserted based on intended meaning (Ferreira & Bock, 2006). So, as these word sequences are produced, they are simultaneously acquired, stored, and then reinforced through subsequent repetitions of that structure. Therefore, “the production system learns” (Chang, et al., 2000).

For children, implicit learning through structural priming can lead to the acquisition of syntactic representations (Ferreira & Bock, 2006). Leonard (2010) determined that despite lacking knowledge of a syntactic structure, hearing these could increase a child’s production of these word sequences, without having ever produced

them before. Furthermore, children attend to most frequently heard language input regarding bound morphology (Sanz-Torrent, et al, 2008). Therefore, if a child hears a novel structure repeatedly, they are more likely to produce it themselves. Priming facilitates the development of grammatical encoding to establish a repertoire of syntactic structures (similar to a database of possible word order) that is organized into phrasal representations, dependent or relevant to linguistic or meaning based contexts (Ferreira & Bock, 2006).

Bilingual children with specific language impairment can be identified through monitoring their production of English and Spanish clinical morphological markers. Priming is an appropriate assessment model to elicit the production of these markers. When a child is presented with a prime sentence and is unable to produce the specific syntactic structure that contains a clinical marker, it indicates difficulty with language acquisition. Then because the production system learns, with repetitive exposure to priming tasks, a child should be able to acquire the targeted structures.

## **Methods**

### **PARTICIPANTS**

The subjects were three children from the Austin, Texas area. For the purpose of the study they are referred to as Ana, Benito, and Carlos. Ana was a 4-year, 7-month old female, enrolled in an English preschool. Her father was a native Spanish speaker, however the family mostly communicated in English in the home. Her mother reported that Ana expressed herself in English and could label 15 words in Spanish. Testing with Ana was conducted only in English. Benito was a 6-year, 7 month old male, enrolled in a bilingual kindergarten class. His parents were native Spanish speakers and Spanish was the primary language used at home. Benito was first exposed to English at age 5 at school, where he communicated in both English and Spanish. Carlos was Benito's older brother; age 10 years, 11 months. He was also first exposed to English at age 5 in school; both are sequential bilingual language learners. He attended the fifth grade in an English classroom. The assessment was conducted in both English and Spanish with Benito and Carlos. All three children were typically developing, and there were no reported developmental delays or academic concerns.

### **MATERIALS**

The subjects in this study were shown 122 photographs; 68 for English targets, 54 for Spanish. Visual stimuli targets were developed based on commonly used, acquired and picturable verbs with respect to common themes and daily action in the lives of

school-aged children. The photographs depicted the agent and action; they were presented along with a prompt intended to elicit the target verb inflection. To develop the targets, relevant morphosyntactic characteristics of English and Spanish were considered. In Spanish, these qualities included plurality, regularity versus irregularity, the presence of an object, the gender of nouns and objects, and verb ending type (*ir/er/ar*). In English, the plurality and regularity of verbs were considered, as well as the presence of a direct object or verb phrase. These characteristics were manipulated to establish balance in the variety and contrasting qualities in the sentences that incorporated the identified verb structures to create preliminary pairs for parallel target and prime sentences for the examiner and participant.

The selection of target morphosyntactic structures was guided by the difficulty levels established by Eagleson (2010), based on bilingual children's performance on test items from the Morphosyntax portion of the Experimental BESA-ME (Peña et al., in prep), an assessment tool in development that aims to identify bilingual children with language impairment. When the performance of both TD and LI participants was compared across 3 school age groups, the most discriminating morphosyntactical forms were determined to be: 3<sup>rd</sup> person singular *-s*, past tense (*-ed* and irregular) and copulas in English. In Spanish, the most discriminating structures were the imperfect tense, direct object clitics and the use of subjunctive.

It was determined that the subjunctive was not an appropriate Spanish target for this priming study because it requires an increasingly complex theory of mind, as it demands a wide frame of reference of reality and knowledge of existence beyond the

present (Pérez-Leroux, 1998). This would be a factor outside of bilingualism and language impairment that could impact a subject's performance. Furthermore, this structure requires extensive background information to demand its use, which could not be established with one-sentence targets elicited through short 1-3 word carrier phrases. Copulas were excluded for English because of complications for picturability and difficulty creating a natural scenario that demands the use of copulas with relationship to stimulus pictures.

The Google Images search engine was used to locate relevant, real life pictures of people completing the actions described in the sentences. Research has shown that students in kindergarten through 11<sup>th</sup> grade prefer photographs to simple and complete line drawings (Myatt & Carter, 1979).

The pictured sentences were divided into groups for the baseline, targets, and primes. Sentences for the target and the prime contained similar morphosyntactic characteristics, but different content. Pictures and sentences that were concrete and those that were phonologically obvious within the coarticulation of a sentence were chosen for the child's baseline and target stimuli. For example, an examiner could more accurately detect the production of the 3<sup>rd</sup> person singular *-s* in a sentence such as "The girl bites an apple" than in "The girl bites salmon", where the inflection of *-s* in bites would be inseparable from the onset of the word salmon.

In addition to the priming task, the children were required to produce narratives, two in either language. The narratives were elicited through Mercer Mayer's wordless picture *Frog* books (Mayer, 1969). Three of his books were used including *Frog Where*

*are you?*, *Frog on his Own*, and *One Frog Too Many*. The purpose of the narrative task was to elicit a language sample and analyze it for the subject's spontaneous production of the target structures as it compared to elicitation during the priming task.

### **Apparatus**

Participants viewed stimuli in a Microsoft Word 2008 for Mac version 12.2.9 document on a MacBook 5.1 laptop. Their responses and narrations were recorded with an Olympus Digital Voice Recorder *WS-321M*. The narrations were coded using Systematic Analysis of Language Transcripts *SALT* software.

### **PROCEDURES**

A bilingual speech language pathology graduate student administered the narration task and priming paradigm in a quiet room in the subject's home. Testing in English and Spanish occurred during the same session, English first and then Spanish. All of the participant's productions were recorded and transcribed verbatim.

Testing in English and Spanish began with short conversation with the examiner, then the narration tasks. For Benito and Carlos, the subjects were asked to retell *Frog Where Are You?* in English, after the examiner read the story from a script. Then, the subjects told *One Frog Too Many*, without a model from the examiner. This was followed by the two English priming sets. Upon completion, the examiner told the subjects they would now speak in Spanish and then chat in Spanish for a few minutes. The subject was instructed to produce a retell of *Frog on his Own* in Spanish, then

independently tell *One Frog Too Many*, last they completed the Spanish priming sets (Mayer, 1969).

The priming paradigm was a cloze task. The subject was asked to complete the examiner's sentence. For example, the child was shown a picture of a girl riding a bike and the examiner pointed to the picture and said the carrier phrase "Yesterday, the child \_\_\_\_\_" and then paused. The subject's response was recorded.

There was a baseline and testing condition. During the baseline, the examiner gave a prompt such as "I am going to show you pictures of what happened yesterday. I want you to finish my sentence". The child was presented with a photograph of a person or animal in action. The subject's performance on the baseline task demonstrated their production or lack of the target structure when elicited without a prime.

In the testing condition, the examiner announced that they would take turns with the subject. Two pictures were arranged side by side on the word document. The examiner went first, pointed to the photo on the left and produced the prime sentence containing the target structure. Then, they pointed to the photo on the right, said the carrier phrase and again paused to elicit a response (just like the baseline). If the child's verb inflection mirrored the target in terms of regularity, irregularity, and appropriate tense, then they have been effectively primed. For example, if the child did not consistently produce the past tense regular verb -ed structure during the baseline, but, during the testing condition the examiner said "Yesterday, the woman picked a flower" and then "Yesterday, the girl..." and the child said "played the piano", the child was effectively primed. This was repeated for all target structures in both languages.



## ANALYSIS

The subject's narrations were transcribed in *SALT* and coded for the accuracy of production of the target morphological structures. In English, this was the third person singular *-s* and the regular and irregular past tense verbs. Spanish narrations were coded for appropriate use or missing direct object clitics, as well as regular and irregular imperfect verbs. These spontaneous productions were compared to those elicited during the priming task. A qualitative analysis was conducted for the presence and strength of the priming effect based on a comparison of the accuracy of targets in the baseline versus testing condition.

## Results

The primary purpose of this study was to develop appropriate targets for structural priming tasks in Spanish and English to examine typical morphosyntactic development of bilingual children in early elementary school. This analysis aimed to determine the pattern responses to priming in typically developing children and examine the relationship between grammaticality of a narrative sample as it compares to the subject's production on the cloze priming task

### ENGLISH

Table 1 depicts each subject's accuracy in the production of the target verb inflection. The baseline tasks elicited the same level of accuracy in the children for each group.

For the 3<sup>rd</sup> person singular baseline, Benito produced all verbs in the present progressive form (*is + present participle*), while Ana produced verbs mostly in the past progressive form (*was + present participle*), and Carlos began using the past progressive, but then switched to the past tense *-ed* inflection. When presented with a prime, all of the children greatly increased the accuracy of their use of the 3<sup>rd</sup> person singular *-s*.

During the baseline testing for the past tense *-ed* and irregular past inflection, all of the participants produced verbs in the past progressive form, except for *fell*, which was produced accurately by all participants. The subjects continued to produce the target verbs in the past progressive form during the testing condition, however the oldest

participant Carlos began to accurately produce the past tense forms, both regular and irregular, after two priming sets. Benito produced *swam* appropriately and Ana produced *broke*, which demonstrates the children were beginning to acquire irregular forms. Ana also over-regularized the verb run and said *runned*. This is expected in the language output of typically developing children (Jacobson & Schwartz, 2005).

Table 1

Accuracy of target structure during English priming task by subject

	<b>3<sup>rd</sup> Person Singular –s</b>		<b>Past tense –ed/ Irregular</b>	
	<b>Baseline</b>	<b>Test</b>	<b>Baseline</b>	<b>Test</b>
<b>Ana</b>	0%	90%	13%	1%
<b>Benito</b>	0%	70%	13%	1%
<b>Carlos</b>	0%	100%	13%	71%

### Ana

During Ana’s narration samples, she was inconsistent in her production of regular and irregular past tense verbs. For example, she produced both *looked* and *look* in contexts requiring the past tense –ed verb. Also, she frequently produced errors with the over-regularization of irregular verbs, ex. *maked* instead of *made*, which is consistent with her performance on the priming task. In the 3<sup>rd</sup> person singular task, she said *flying* without the mandatory *is/was*, but she did produce the irregular past tense *flew* during her narration. Her performance on the priming task indicates linguistic uncertainty of the manipulation of irregular past tense verbs in the present tense.

## **Benito**

During his narration, Benito demonstrated preference for the production of present and past progressive in both Spanish and English. This is typical for Spanish dominant English learners because the gerund form is similar in both languages. He inconsistently produced English past tense verbs in his narration, having said *went* and *go* in contexts demanding the past tense. The past tense *fell*, *was*, *were*, and *went*, were the only past tense verbs he produced.

## **Carlos**

Carlos' production of irregular and regular past tense verbs was accurate during his narration, which was consistent with his performance during the priming task. Because narrations generally demand the past tense except for dialogue, he did not produce the 3<sup>rd</sup> person present tense, so the narration task was not representative of his ability to accurately produce this structure.

## **SPANISH**

Table 2 depicts the two subject's accuracy in their production of the target Spanish morphosyntactical structures. They both were moderately accurate in their use of direct object clitics during the baseline and did not produce the imperfect past tense in the baseline task.

With direct object clitics, Benito produced them in 5 of 7 opportunities during the baseline, but 2 were incorrect in terms of plurality (ex. *lo* instead of *los*). Given a prime, he produced a clitic in all 9 opportunities, but 3 were incorrect; 2 related to plurality and

1 to gender agreement (ex. *la* instead of *los*). Carlos produced clitics more frequently during the baseline, but was not completely consistent, however given a prime he accurately produced clitics in every opportunity.

During the imperfect baseline priming task, both subjects produced verbs in the present tense, despite carrier phrases such as *a veces/sometimes*, *cada día/everyday*, and *siempre/always*, which demand the use of the imperfect tense. Given a prime, both participants greatly improved their use of the imperfect. Carlos produced two errors; one he said *limpian/they clean* in the present tense and the other was *vuelan/ they fly*, instead of *volaban/they flew*. This error may be indicative of linguistic uncertainty with verbs he knows are sometimes irregular.

Table 2

Accuracy of target structure during Spanish priming task by subject

	Direct Object Clitics		Imperfect Past Tense	
	Baseline	Test	Baseline	Test
<b>Benito</b>	43%	66%	0%	100%
<b>Carlos</b>	57%	100%	0%	80%

### **Benito**

During Benito’s Spanish narrations, he frequently used the gerund form with *estaba* (similar to present progressive in English). The majority of his narrations were in the preterit tense. The imperfect past tense verbs he used were mostly in rote form (*había una vez/once upon a time*) or for describing a state of being (*estaba enojado/was mad*). Benito did produce the imperfect forms *pesaba/weighed* and *estaba/was* as a copula

without the gerund. On one occasion he accurately produced a direct object clitic during narration.

### **Carlos**

The majority of Carlos' verb use within his narrations was in the preterit. He accurately produced the imperfect for various verbs, like *miraba/looked* and *le dolía/it hurt*. Carlos spontaneously produced direct object clitics, for example he referred to *una mosca/a fly* when he said *cuando la comió*. He did produce some in error in terms of gender. This was consistent with his production of article errors for noun gender. This is typical of children transitioning from Spanish to English dominance.

## Discussion

The purpose of this thesis was to establish targets for a priming task that demonstrate the process of language learning that occurs in typically developing bilingual children. Difficulty with the production of accurate morphemes and syntax is a characteristic of monolingual children with specific language impairment (Jacobson & Schwartz, 2005). This includes the accurate production of tenses and the morphological markers they require. So, establishing the productions of morphemes and syntax with typically developing bilingual children provides a comparison for their peers with language-impairment. When the strength of the priming effect for each task is determined, it provides information about how to support language learning in children with language impairment, to develop an appropriate intervention strategy through structural priming.

In English, the priming effect was strong for the third person singular structure. None of the children produced this inflection during the baseline task and all of the children used this infrequently in their narrative language. The gains demonstrated that given a model, typically developing children can accurately produce the 3<sup>rd</sup> person singular *-s*. Ana and Carlos have 4 and 6 years of exposure to English respectively, while Benito has about 1.5 years of exposure. Therefore, he is still acquiring verbs in his lexicon and learning to manipulate the inflection. For example, when prompted with *Here, the girl...*, he said *dance*, instead of *dances*. As an English learner, the second /s/ sound may not have been as phonetically salient. However for 7 of 10 of his responses

during the testing condition, he was accurate in the production *-s*, which demonstrates that with the support of a model he implicitly learned to produce the inflection within that context.

These findings are consistent with current research of bilingual grammatical development. The third person singular *-s* proves to be a morphological marker that is frequently produced in error by children with LI. In a study examining LI and TD children between 3;8 and 5;7, the LI children produced the English 3<sup>rd</sup> person singular tense in a third of the obligatory contexts; whereas their TD peers produced the structure accurately with 90% accuracy (Leonard, et. al, 1992). The standard deviations did not overlap. This indicates that the production of the 3<sup>rd</sup> person singular structure is an appropriate means to differentiate between children with language impairment and their typically developing peers.

The past tense *-ed* and irregular forms did not demonstrate a priming effect for the younger subjects. Ana and Benito had lower accuracy during the testing condition because there were a greater number of opportunities, yet they only produced one target accurately in both conditions. Carlos, the late elementary school subject, did demonstrate a strong priming effect. This indicates that early elementary students are in the process of learning the past tense structure, and Carlos' inconsistency demonstrates that this inflection remains difficult for older English language learners. This could be an appropriate target for therapy however, if the children across the elementary age range demonstrated increased accuracy in their production of the past tense forms with multiple administrations of the task across time.



The participants' performance is similar to Jacobson and Schwarz' 2005 study. Upon examining the production of the regular and irregular English past tense verb forms in sequential Spanish-English bilingual second graders, they found that both TD and LI children produce errors (Jacobson & Schwartz, 2005). However, they discovered production patterns to differentiate between LI and TD children. They found that LI children rarely over-regularize verbs (ex. "maked" instead of *made*), while TD children do. Children with LI produced the present progressive (making), instead of the target (made) with double the frequency when compared to their TD peers (Jacobson & Schwartz, 2005).

The observation that all of the children produced *fell* accurately during the baseline condition of past tense English indicates that could be an important indicator of language ability. Children frequently hear this word because they fall frequently and observe other children doing so, generally adults respond with "you fell, you are ok" or something similar. Also, kids often drop things as they develop motor skills, so *fell* is an irregular form that is frequently heard and salient in their lives. This is consistent with the findings of Sanz-Torrent, et al. (2008), which determined that with repeated input of a novel structure, children would produce it themselves. Benito, with less than two years of exposure to English produced *fell*, which demonstrates early acquisition of this irregular form. *Fell* in particular should be tested with language impaired children to observe if they have command of this irregular verb as well and it could serve as an early target during intervention.

During the Spanish tasks, the subject's performance with direct object clitics

demonstrated a moderate priming effect. Both of the subjects included clitics in all of their responses during the testing condition, but Benito was inaccurate in terms of gender or plurality for a third of them. However, this could be related to the subject having not produced the target noun due to the nature of the cloze task. He did not frequently use this morphosyntactic structure during his narration, but when he did so, it was appropriate. So, the cloze task may have reduced the link between the noun that the clitic referred to because he only heard and did not produce it. During the narration task, Carlos was inconsistently accurate in the gender of both articles and clitics, which may indicate some language loss. This target would be appropriate for bilingual early elementary students.

Direct object clitics (the representation of a previously mentioned noun by *lo*, *la*, *los*, or *las*) has been investigated extensively as a morpheme that Spanish-speaking children with LI do not accurately produce. Bedore and Leonard (2001) determined that there was a significant difference in the accuracy of production of direct object clitics by their LI and TD subject groups between the ages of 3;11 and 5;6. The children with LI produced this structure on average with 40% accuracy, while their same age TD peers produced it with a mean of 80% accuracy. There was no overlap within the standard deviations (Bedore & Leonard, 2001), indicating that this is a discriminating feature in the language production of TD and LI children, which is consistent with the results of this study.

The participant's performance on the imperfect past tense priming condition indicated a strong priming effect. With a prime, both children accurately produced the

imperfect past tense. During narration, Benito rarely produced the imperfect, solely for rote phrases and when describing emotion. Carlos was more consistent in the production of the imperfect in narration than in the testing condition. This target would be appropriate for children with language impairment during intervention, as the young elementary subject produced both the *-ir/-er* and *-ar* forms of imperfect with a model.

There is limited data regarding the acquisition of the past tense in Spanish, in regards to TD versus LI children. Bedore and Leonard (2001) found that children with LI produced the 3<sup>rd</sup> person past tense singular and plural with less accuracy than their TD peers. However, there was a slight overlap within the standard deviations. Therefore, this morphological feature has the potential to support the differentiation of LI and TD children and should be investigated further.

This analysis indicates that the third person singular structure *-s* in English and the imperfect tense in Spanish have strong priming effects for the typically developing subjects in this study. These would be appropriate to test on bilingual LI children. Given distinct patterns of accuracy presented in current research, both direct object clitics in Spanish and past tense verbs in English could be targeted during intervention to improve the language skills of LI bilinguals.

The performance of the subjects and results of this study are concurrent with priming literature (Bock, Dell, Chang, & Onishi, 2007, Ferreira & Bock, 2006). Based on a change in output across the baseline and testing conditions, the participants demonstrated that an auditory model influenced their language output in terms of syntactic and/or morphological structure. This effective priming demonstrated that the

subject's production systems learned, which indicates the implicit acquisition of knowledge (Chang, et al., 2000).

## **LIMITATIONS**

There are limitations in this study that should be considered. The first is the small number of typically developing subjects across a wide age range that participated in this study. Patterns of response types and accuracy of productions would be more concrete with a large cohort of participants that included both typically developing and language impaired bilingual early elementary school students.

Another limitation of this study is that it is a qualitative analysis. Given a large subject pool, an analysis of item discrimination and difficulty would allow a quantitative scoring system to be established for an in depth analysis. A statistical analysis of sensitivity and specificity would allow concrete patterns of responses to be determined.

Additionally, only one prompt was produced to elicit responses from the subjects for each target structure. If the elicitation prompts were altered slightly and multiple forms were presented to different groups of children, there may be one that could result in responses that are consistent with the targets. This may create a difference in the strength of the priming effect observed. For example, the examiner said "Look at this picture and tell me what happened yesterday" for the English past tense baseline in this study. There may be a different result if an examiner said "tell me what they did yesterday".

## **CLINICAL IMPLICATIONS**

Through gaining knowledge about typical bilingual language development, the results of the study established a comparison for bilingual language impaired children. This study determined that typically developing bilingual children could be influenced by a prime in both of their languages, even with relatively limited exposure to one language. Furthermore, it demonstrated that bilingual children can learn to produce a morphosyntactic structure based repeated priming models. This encourages that the implicit learning that occurs during priming could be translated into an intervention technique.

The development of the priming task for this study provided materials that could be used in the future. Preliminary baseline, prime and target items and stimuli were established for future priming studies and intervention. The performance of the subjects on this assessment could guide the selection of items to be included, altered or discarded. Furthermore, the findings provide information about how bilingual children perform on structural priming tasks and preliminarily determined expected responses from bilingual school aged children. This could translate into a reduction of the misidentification of bilingual children as language impaired.

## **FUTURE DIRECTIONS**

The future directions for this thesis are to expand and rearrange the baseline, prime, and testing items and prompts based on the production of the subjects. Then the structural priming task is to be administered to a large participant pool of early

elementary bilingual children, both typically developing and language impaired to identify patterns of production, priming strength, and implicit learning. Furthermore, this priming task could be translated to an intervention technique to be administered to many language impaired children, during multiple sessions over time to establish the impact on their acquisition of specific morphosyntactic structures. This information has the potential to support bilingual language acquisition knowledge, as well as assessment and clinical intervention of bilingual children with language impairment.

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